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# The Mining Journal

LONDON, APRIL 15, 1960

Vol. 254. No. 6504. Price Ninepence

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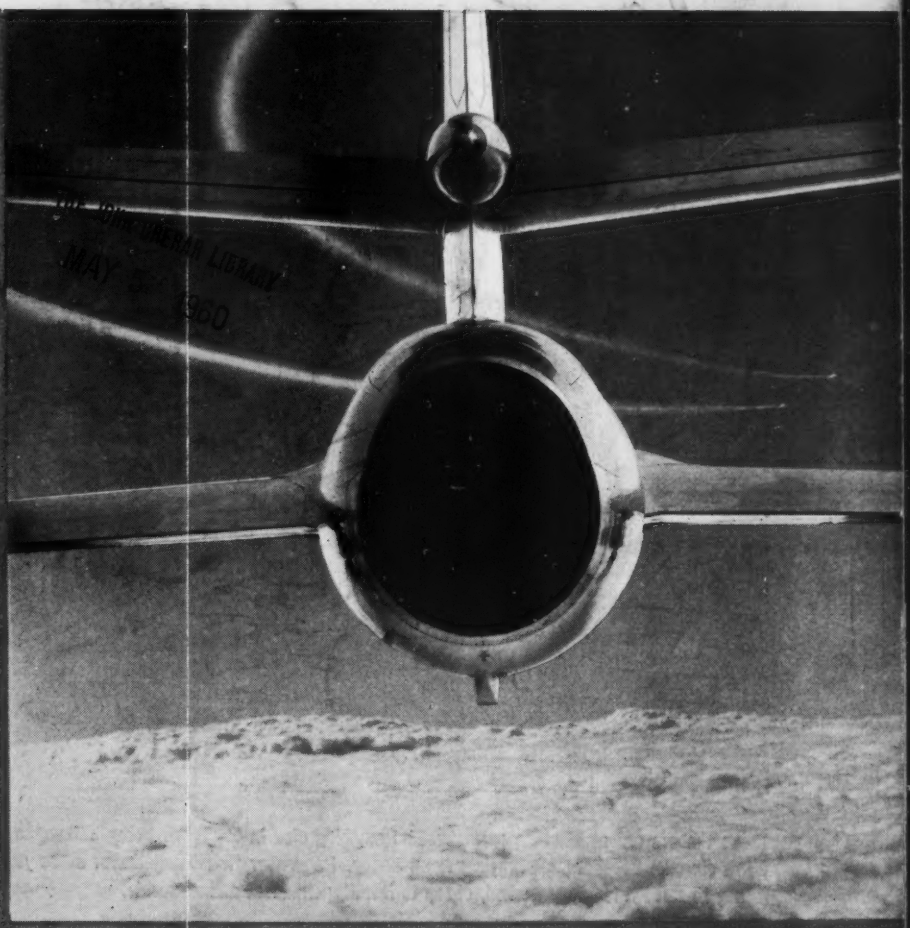

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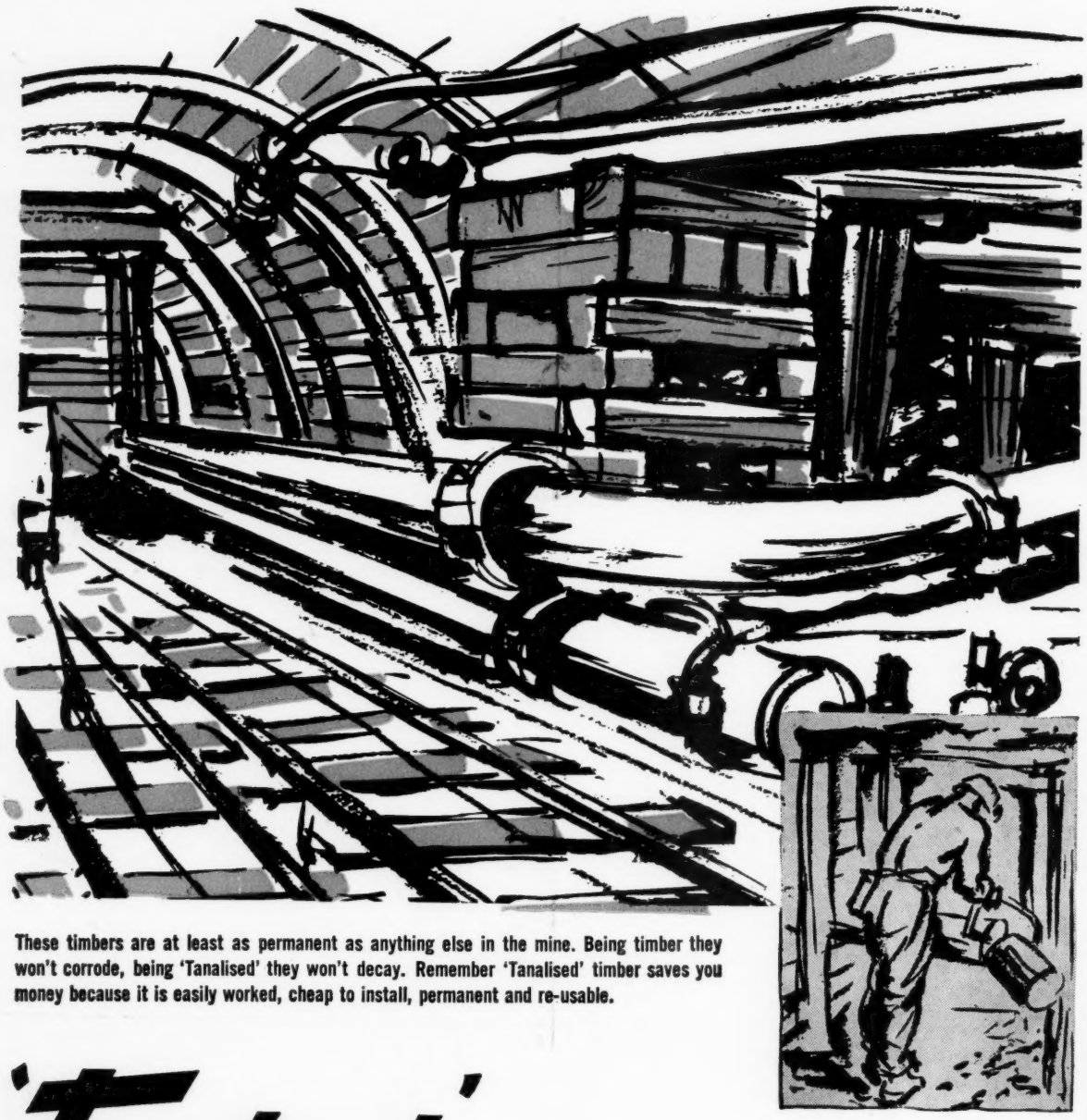

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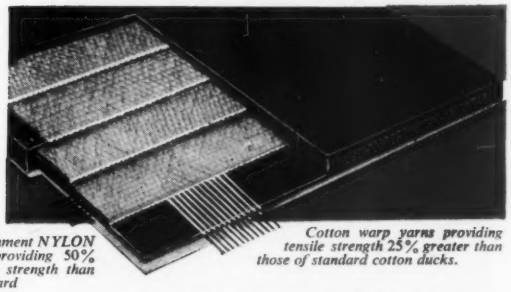

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P.4144

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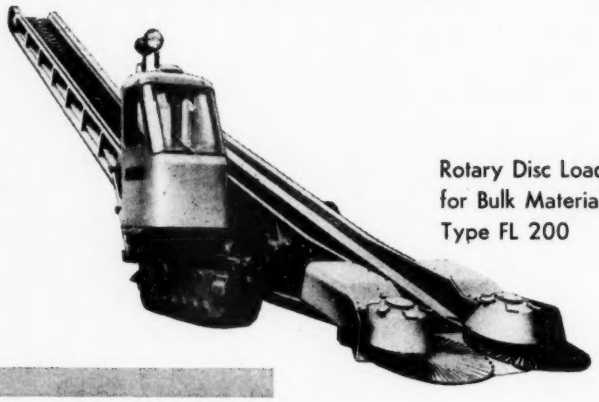
## for Coal Mining



Rotary Disc Loader
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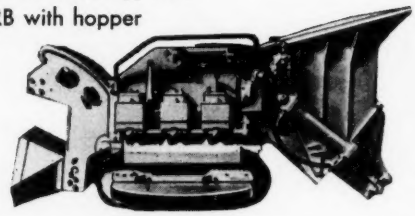
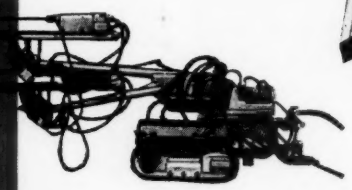
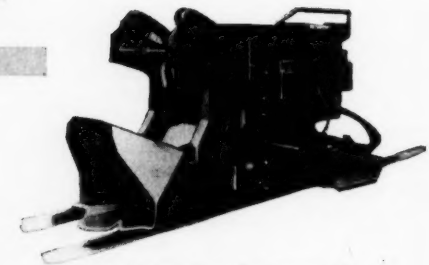
Type FL 200

Salzgitter-Loader
crawler-mounted Type HL
280/RB with hopper





Double Boom Drill Rig on
Crawlers Type KB 2/R with
Rotary-Percussive Drill



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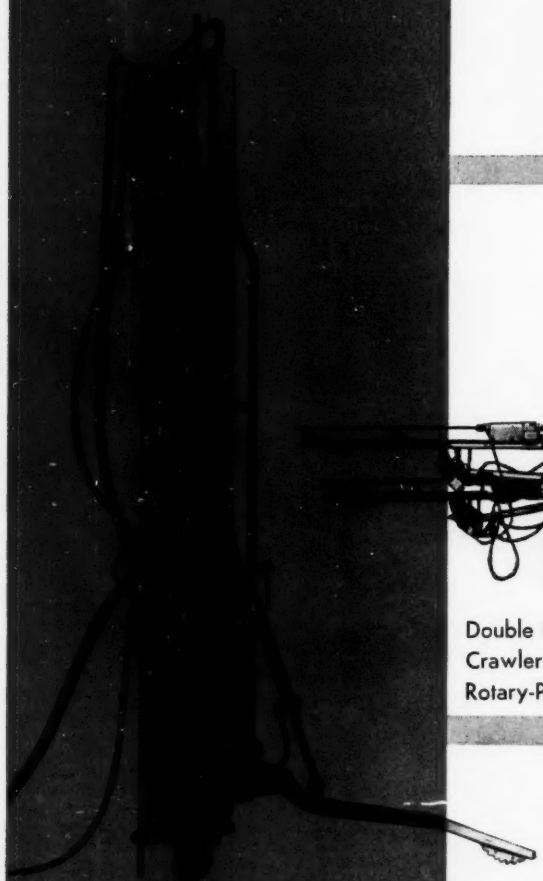
to 18 cb. ft. bucket capacity



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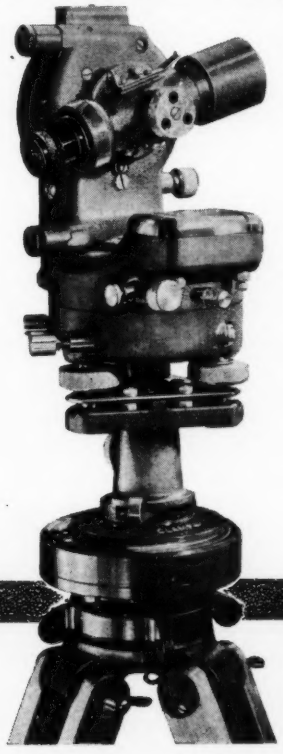

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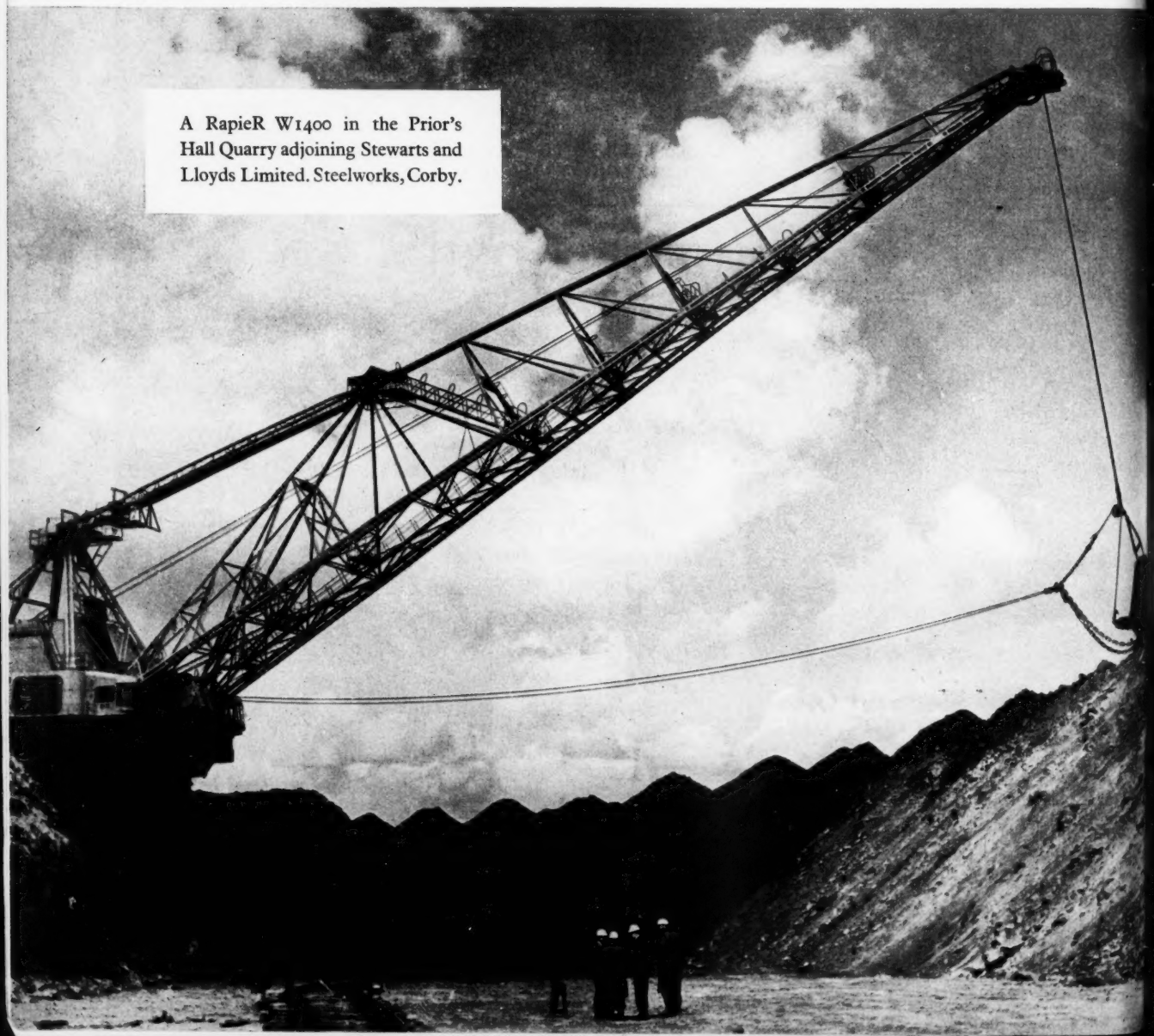
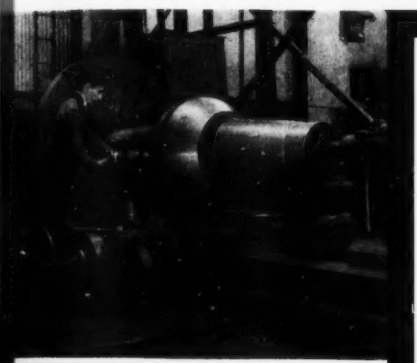
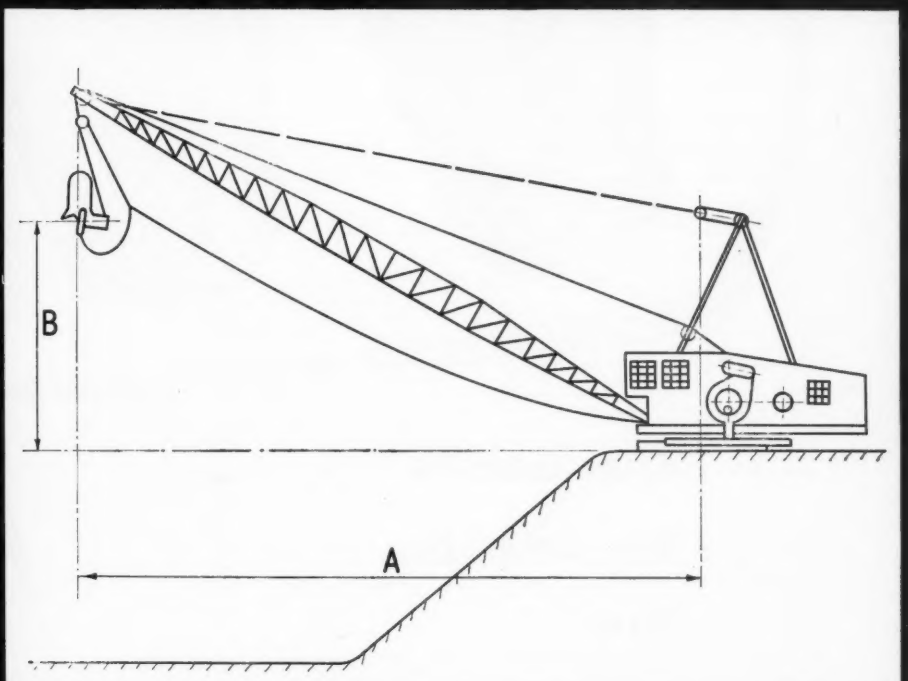


A RapieR W1400 in the Prior's Hall Quarry adjoining Stewarts and Lloyds Limited. Steelworks, Corby.

# ST WALKING DRAGLINES



s of a RapieR W 1400 under construction

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| TYPE | LENGTH OF BOOM | BUCKET CAPACITY CU. YD. | DUMPING RADIUS A | DUMPING HEIGHT B | WEIGHT IN TONS |
|---|---|---|---|---|---|
| W 150 | 149′ 0″ | 3 to 3½ | 148′ 0″ | 46′ 0″ | 193 |
| | 132′ 0″ | 4 to 5 | 132′ 0″ | 35′ 0″ | 189 |
| | 121′ 0″ | 5 to 6 | 118′ 0″ | 38′ 0″ | 186 |
| | 121′ 0″ | 6 to 7 | 105′ 0″ | 57′ 6″ | 184 |
| W 300 | 180′ 0″ | 5 to 6 | 178′ 0″ | 70′ 0″ | 375 |
| | 140′ 0″ | 7 to 8½ | 142′ 0″ | 52′ 0″ | 375 |
| W 600 | 204′ 9″ | 8 to 10 | 201′ 0″ | 72′ 0″ | 792 |
| | 186′ 0″ | 10 to 12 | 184′ 0″ | 65′ 0″ | 777 |
| | 165′ 0″ | 12 to 15 | 165′ 0″ | 55′ 0″ | 776 |

| TYPE | LENGTH OF BOOM | BUCKET CAPACITY CU. YD. | DUMPING RADIUS A | DUMPING HEIGHT B | WEIGHT IN TONS |
|---|---|---|---|---|---|
| W 900 | 247′ 0″ | 16 | 230′ 0″ | 100′ 0″ | 950 |
| | 229′ 6″ | 18 | 215′ 0″ | 90′ 0″ | |
| | 195′ 0″ | 23 | 185′ 0″ | 76′ 0″ | |
| W 1350 | 271′ 0″ | 20 to 24 | 250′ 0″ | 112′ 0″ | 1375 |
| | 248′ 0″ | 29 | 230′ 0″ | 100′ 0″ | |
| | 230′ 0″ | 33 | 215′ 0″ | 90′ 0″ | |
| W 1400 | 282′ 0″ | 20 to 24 | 260′ 0″ | 140′ 0″ | 1650 |
| W 1800 | 303′ 0″ | 20 to 24 | 280′ 0″ | 150′ 0″ | 1850 |
| | 282′ 0″ | 30 | 260′ 0″ | 120′ 0″ | |
| | 247′ 0″ | 40 | 230′ 0″ | 100′ 0″ | |

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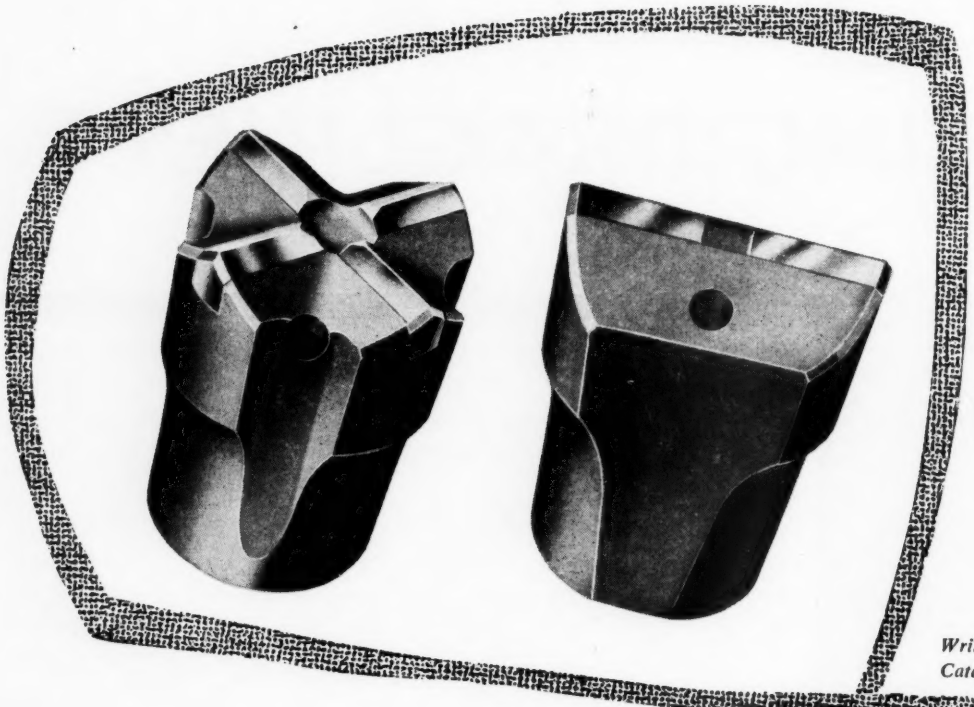

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# The Mining Journal

London, April 15, 1960

## *In this issue . . .*


| | |
|---|---|
| Making Room for the Specialist in Mining | 427 |
| Denmark's Mineral Resources ... ... | 428 |
| Hydraulic Transport in Polish Hard Coal Mines ... ... ... ... ... | 429 |
| Mining Prospects in Mongolia ... ... | 430 |
| Materials for Russian Steel ... ... | 431 |
| Are We Making the Best Use of our Graduates? ... ... ... ... | 432 |
| Up Draught Zinc-Lead Sintering ... ... | 434 |
| Ferrous Metal Plans in Asia ... ... | 435 |
| Machinery and Equipment ... ... | 436 |
| Mining Miscellany ... ... ... ... | 438 |
| Metals and Minerals ... ... ... | 439 |
| Mining Finance ... ... ... ... | 440 |
| Company Meetings ... ... ... | 442 |
| Professional Directory ... ... ... | 445 |
| Publications Received ... ... ... | 446 |
| London Metal and Ore Prices ... | Cover iii |


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*Editor*
U. Baliol Scott
*Deputy Editor*
A. Graham Thomson

*Assistant Editor*
R. Bowran

*Assistant Financial Editor*
R. A. Nuttall

*Display Advertisement Manager*
E. S. Hooper

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## Making Room for the Specialist in Mining

THERE are a number of factors which have contributed to delaying the development of the " line and staff " concept of organization in the mining industry.

In the first place, mining is a relatively hazardous occupation and, as in all such occupations, the personal accountability of the men in command at various levels is heightened so that, the " line " or production executive is more than averagely prone to override the specialist.

This situation has, in turn, meant that the great majority of promotional opportunities to the higher ranks of the industry have lain with jobs where the ability to get production and to manage men have been the principal qualifications.

Moreover, the qualities of leadership and toughness, which the mining industry is pre-eminent in requiring of its executives from the mine manager down to the shift boss, tend to breed the type of man who is inclined to dictate rather than delegate and to whom the somewhat sophisticated human relationship which must develop between the " line " executive and the " staff " specialist does not therefore come easily.

Beyond this, it must be confessed that it is only within the past twenty or thirty years that mining began to demand the high standards of technical expertise which it does today. In this period, concepts of payability have changed so radically that the techniques and standards which served to mine " payable " ores in the decade after World War I would often have been totally inadequate to make a profit since World War II. Underground, this has meant handling much larger tonnages, and consequently developing more efficient methods of breaking ground, better mechanical handling, more efficient methods of valuation and surveying and above all more efficient methods of planning and costing mining operations. Meanwhile a similar revolution has been going on both in the mill and smelter and among geologists.

This is all part of the mining industry's day-to-day experience. It has, however, been left to Professor Black (whose recent paper to the South African Institute of Mining and Metallurgy we quote at some length on page 432) to point the moral.

The moral is first that managerial responsibilities and technical specializations do not mix. The boffin is seldom a leader of men. Secondly, it is that because promotion to more senior positions in the industry is almost entirely through the mine management hierarchy, the graduate, who has high technological qualifications but little aptitude or inclination for leadership, is precluded by his shortcomings in the latter from reaching the stage where he can exercise the former at a senior level.

Professor Black does not say so, but it is an interesting speculation that the tendency for senior managerial responsibilities to be conducted by " consulting engineers " could be more than just an organizational oddity. May it be that the men who hold these appointments have spent the first ten or more years of their professional lives being shift bosses, mine captains and eventually

underground managers and have consequently become conditioned to think in " executive " terms when later in life they come to be " consulting engineers " ?

The consequences both in terms of distortion to the organization structure and frustration to the individual which can arise from a misunderstanding of the relationship between the " line " executive and the " staff " consultant constitute a problem of particular urgency for mining, which it is not our intention to re-examine here. Readers may, however, recall the series of articles in *The Mining Journal* on this crucial subject which appeared in November 1956.

For the moment we would merely point out that " line and staff " relationships are inherent in any engineering process as complex as mining and that the misunderstanding of their nature tends to breed both mine managers who regard themselves as their own best consultants and consultants who refuse to give up being managers.

Both these conditions arise from a failure to distinguish between the purely technical authority, which a man commands by virtue of his specialist know-how, and the executive authority of the manager with whom must rest the ultimate responsibility for giving effect to the technical advice he is offered.

An unfortunate consequence of the dominance of the manager type in mine organization is that it results in a considerable number of young graduates leaving the mining industry because they have not got the leadership characteristics to advance through the mine management hierarchy, which is still the only recognized ladder of promotion. Nevertheless, these men could be of inestimable value to the industry if channels of advancement were open to them through their own specializations. It is rather as if the British army were to have difficulty in keeping its R.E.M.E. officers or its doctors because advancement in these specialist corps was dependent on success as a platoon or company commander.

This at least is the argument that Professor Black puts forward in the context of South Africa, but much of what he says has a relevance far outside that country. Certainly this is so to the extent that the mining industry is having difficulty everywhere in obtaining its full quota of graduates, not least those with the inclination to specialize. To this extent it can ill-afford any subsequent wastage through square pegs being in round holes as a result of failure to provide channels of professional advancement suited to the qualities of the individual or the requirements of the job.

Moreover, in South Africa, the problem may have an especial relevance at the present time. Here we have a country which, as we tried to show in last week's issue, is now inescapably faced — probably sooner rather than later — with both a changing economic and eventually political status for the African. This is going to mean higher African wages, not only in industry but in the mines as well. This must eventually mean a stabilized African mine labour force if only because the ending of the migratory system is an essential pre-requisite to higher African working efficiencies. This in turn must also mean that in the long run subordinate mine jobs at present performed by Europeans will either be taken over by Africans or will be fragmented so that the simpler elements in these jobs can be performed more cheaply by them.

All this must in turn lead to more intensive mining methods, greater mechanization and above all the need for more European personnel both in supervisory and in specialist maintenance jobs. It follows that increasing burdens will be placed on the senior personnel in the industry who are going to have to plan and manage and devise new methods of operation as never before, so as to enable the industry to stabilize its costs by taking full advantage of a more highly paid and more efficient African force.

It is perhaps in the context of this eventual challenge that Professor Black's remarks in Johannesburg last week should be seen as having an especial significance.

## DENMARK'S MINERAL RESOURCES

Although Denmark is by no means one of the richest countries in mineral deposits, recent years have sent up production and exports of mined products and seen the discovery of new deposits and the building-up of a modest industry. Output is restricted almost exclusively to Greenland, now an administrative part of Denmark, and to the Jutland peninsula of Denmark itself.

It is in Jutland that several production schemes are planned for the future. Lime deposits in the Grenaa area are to be used as base material in a £5,000,000 plant for the production of ammoniacal fertiliser to be established by a consortium consisting of the Danish company Dansk Svovlsyre og Superphosphat-Fabrik and the Norwegian chemical and mineralogical firm Norsk Hydro operating through the joint company A/S Ammonia; this will come into operation in 1962. A further 1,500,000 tonnes of brown coal were found in Jutland last year, and it is expected that the existence of a further 3,000,000 tonnes will be established in an area bordered by Herning, Videbaek, Holstebro and Resen at present being explored. At present Danish lignite deposits are estimated at 50,000,000 tonnes, and borings are to continue for a further three to five years.

Main export products of the Danish mineral industry at present include bog ore, now sold to every country in Europe and to India. Biggest customer is the British gas-producing industry, and some 60,000 tonnes of ore are shipped to the United Kingdom annually. Exports of this product are rising steadily. Both diatomite which is obtained in North Jutland—and kieselguhr are produced in relatively large quantities and much of the production is exported. Some 25,000 tonnes of the high-quality Danish chalk grades are exported per year. Flint, claimed to be the best in Europe, is an important export item, in both crushed and calcined forms. Kaolin is produced in some quantity and used by the ceramic industry, though it is not pure enough for porcelain manufacture. In South Jutland manganese sulphate is produced in 25 per cent manganese form by the Danish Manganese Sulphate Factory in Aabenraa, just north of the German border.

Greenland has for many years been the white hope of mineral explorers, but despite searches for a range of minerals including gold, silver, nickel, lead, graphite, marble, coal, oil and uranium, mineral production is still at a fairly low level. One of the main products remains cryolite, which despite competition from bauxite in the aluminium industry which it serves, is still exported at a good rate. Based on the port of Ivigtut, in south-western Greenland, the cryolite industry celebrates its one-hundredth anniversary this year. With annual exports of between 40,000 and 50,000 tonnes a year, the mineral makes the biggest single contribution to Greenland's economy.

Lead glance and zinc blende continue to be produced at Mesters Vig, in the north-east of Greenland. However, the Nordic Mining Co. in its annual report states that the deposits will be exhausted by the summer of 1961.

Developments have taken place in the plans to build a transit harbour for Canadian iron ore on the Greenland coast. A North American - West German consortium, backed by the American Universe Tankships Inc., is now carrying on negotiations to lease the islands of Rype and Tartunguak and certain mainland sites from the Danish Government for 90 years to build a $21,000,000 ore port for Ungava ores.

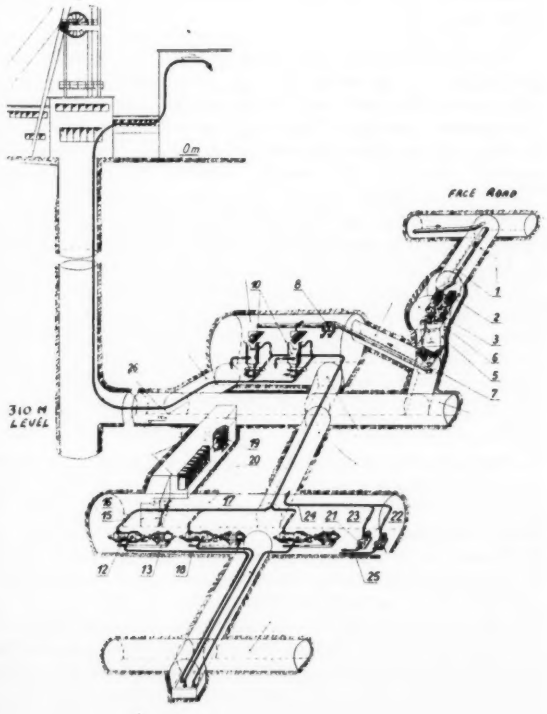
# *Hydraulic Transport in Polish Hard Coal Mines*

*In the course of the past few years some interesting experimental work has been done in Poland on the installation of prototype equipment for hydraulic transport of coal, both underground and from the pit-bottom to the surface. The research on this subject has been centred at the Central Institute for Mining, and has been directed by the author of the present article. The article is translated from an article by Professor Marcin Borecki, in* Przeglad Techniczny, *Warsaw*

THE application of hydraulic transport in coal mines involves fundamental changes not only in transport methods but also in mine layout, since an underground loading point can be connected direct to the surface washing plant by a single pipe of diameter not exceeding 300 mm., capable of transporting 3,000 to 4,000 tons of coal per day. A great saving in maintenance work is offered by the system, since over the whole route there are no moving parts needing servicing, and maintenance personnel are limited to a small number of skilled men supervising the automatic loading plant which feeds coal into the system.

Since the working faces in a mine are widely dispersed and advance rapidly, a hydraulic transport system falls naturally into two sections: the mobile subsidiary system for transporting coal from a continually advancing face to the main roadway, and the main system for raising the mineral to the surface. This is a permanent structure. For underground hydraulic transport, the most economic form is gravitational movement; this is applicable only in inclined seams of a gradient not less than 5-6 deg., where coal can be simply washed down in open troughs. This form of transport is already quite widely applied in many Polish collieries, e.g. the Kosciuszko Nowa, where over 50 per cent of the output is transported from the face by this means.

For vertical transport of coal, there are two possible forms of pump; (i) A centrifugal pump which pumps a mixture of water and coal particles direct into the transporting pipe, and (ii) a water pump, which pumps only water into the pipe, and which works in conjunction with a special feeding installation which introduces coal into the pipe at a point beyond the pump. From the Polish point of view, an advantage of the latter solution is that it makes possible the use of efficient centrifugal pumps, of up to 1,000 p.s.i., at present produced in Poland.




**Hydrotransport of coal: 1. Conveyor; 2. Screen; 3. Single-drum crusher; 5. Stone-hopper; 6. Equalizing hopper for crushed coal; 7. Drum feed mechanism; 8. Conveyor; 10. Feed chamber; 12. Pump (high pressure); 13. Synchronous motor; 15. Revolving valve, 200 mm, 64 atm; 16. Sliding valve; 17. Pump pipeline 200 mm; 18. Suction pipe, 250 mm; 19. Transformer; 20. Distributor; 21. Pump (low pressure); 22. Synchronous motor, 55 kW; 23. Sliding valve; 24. Pump pipeline, 150mm; 25. Suction pipe; 26. Transport pipeline, 250 mm.**

Experiments so far conducted on the construction of coal/water pumps suitable for the transport of coal plus 20-25 mm. indicate that the manufacture in the near future of high-pressure pumps of this type is likely to present considerable difficulty, and that the efficiency of such pumps would not be high. Some centrifugal pumps of this kind are already in use in Polish mines, for the transport of coal up to 80 mm., but they cannot operate at a depth greater than 70 m. Trials are at present being made at the Siersza and Czeladz collieries of prototype centrifugal pumps of higher power, but these can only deal with 6-10 mm. size range.

Since the average depth of Polish collieries is over 300 m., the feeder system was indicated as the more useful line of approach. As mentioned previously, domestic industry is already producing pumps suitable for this process (capable of raising coal from depths of 500-600 m.), and it should be in a position to undertake manufacture of pumps capable of pressures of over 1,500 p.s.i. within a few years.

In considering the problem, there was little foreign experience to draw on as regards the construction of feeders for introducing material into vertical transport pipes. The installations used at Calumet in the U.S. for raising zinc ores from a depth of 109 m. provided something of a precedent, but the problem there was of a different nature owing to the considerable weight of the ore. Coal granules, in contrast, especially the small ones, sink slowly in water, and in fact this rate of sinking of particles of the transported body is a decisive factor in the solution of the question of the appropriate type of feeder installation.

Work on the design of a feeder began in Poland at the Central Institute for Mining (Glowny Instytut Gornictwa) in the middle of 1953. At the end of 1957 a prototype installation was put into operation at the Deviensko pit. This GIG-2, as it was designated, had an output of 100 t./h. of coal mixture (size 0-80 mm.), and was powered by type OW200 centrifugal pumps, working at 64 atm., capable of pumping 4 cu. m./min. A subsidiary underground water transport system was associated with it, and coal was transported from workings at 320 m. over a total distance exceeding 5,000 m.

After one year's working trial, a series of modifications was made, and the installation is now in regular operation at the Debiensko colliery.

The experience gained was then applied to the construction of the GIG-3, a prototype for industrial production. The yield of this machine is 100-200 t./h., and it works at a pressure of 120 atm. The first industrial model is now being built for the Andaluzja mine, where it will raise coal from 310 m. at a rate of 120 t./h. The next GIG-3 will be installed at the Radoszowa colliery, where it will transport coal from a depth of 550 m.

The high pressure system evolved at the Central Institute for Mining makes possible horizontal and vertical transport of coal in mines of practically any depth. The most favourable conditions for its installation are offered by those mines having good supplies of underground water. The practice of hydraulic stowing as operated in many Polish collieries offers great reserves of water.

The ability to transport granules of coal of up to 120 mm. lends itself to the possibility of applying hydraulic transport to steam coal as well as to coking coal. Experience so far indicates that the choice of the speed of flow and the degree of density of the coal/water mixture are factors having an important influence on economy of working, yield, power consumption and efficiency. With a natural flow of water of 5 cu. m./min., about 2,500 tons of coal can be transported per day at a dilution of 3 cu. m. water/ton coal (up to 4,000 t./day at a dilution of 2 cu. m. water per ton of coal).

The major item in running costs is electric power. The prototype installation at the Debiensko colliery, where there are " open flow " conditions (i.e. the water is not returned underground) uses 10-11 kWh/t. of transported mixture over a horizontal distance of 5,000 m. and a vertical lift of 320 m. The consumption of power on coal transport alone, after discounting the power used to transport water from the bottom to the surface, is 4.5-6 kWh/t. This installation is as yet not working in optimal flow conditions. Drainage of water from the mixture at the surface constitutes another item in the costs involved. Hydro-cyclones are employed for the purpose. The water emitted from them needs no further purification, and can be either released direct into the drains or used again for hydrotransport.

Labour costs are low, since the installations feeding coal into the transport pipe are fully automatic and the servicing personnel consists of a small number of skilled mechanics and electricians engaged on control and maintenance.

A possibility envisaged for the future is the extension of the GIG system over greater distances on the surface, to a central processing plant, for instance, or perhaps even to industrial users.

Further experiments on optimal flow conditions, together with work on the development of high pressure water pumps and suitable electric motors, are essential for the future development of hydrotransport. Attention should also be paid to the possibilities of using hydrotransport in mines without a surplus of water, by means of closed-circuit circulation. In such conditions the use of a hydrostatic column of water in the shaft would reduce power requirements considerably, and it would be possible to use less powerful pumps installed on the surface.

# MINING PROSPECTS IN MONGOLIA

DIFFICULT of access to Western visitors, because, though it celebrated the 34th anniversary of its establishment in July last year (1959), it is one of those countries which is officially regarded by their governments as " non-existent", the Republic of Mongolia (formerly " Outer Mongolia ") now stands revealed as a country extremely rich in minerals, though the exploitation of this wealth is still in its very early stages and is in process of comparatively slow development.

Foremost among those minerals which are already in fairly large-scale exploitation is coal, of which reserves have been located at Nailakha, not far from the capital, Ulan-Bator, and in the Choibalsan region, in the north-east corner of the Republic. These are estimated at 500,000,000 tons, and " several thousand " million tons, respectively, and in the former case consist of hard coal, of a quality described as being " not so good as that of the Donbas, but better than that of the Moscow coalfield ". Coal of Russian origin is the obvious yardstick for comparison, because it used to be the coal on which the Trans-Siberian railway was run.

The quality of Choibalsan coal will doubtless be made public when mining is commenced, as it has already been at Nailakha, where seven shafts have been sunk, resulting in a rise in the annual output from 300,000 tonnes, in 1957, to almost 400,000 tonnes in 1958. This output is sufficient to meet all the needs of the capital, Ulan-Bator, with which the mines are linked by a branch railway-line, with a substantial surplus available for use elsewhere. Further increases in production may be expected, since the mines have been extensively mechanized, with machinery suppled from Soviet sources. They have their own hospital and medical services, which are reported to be of a high standard.

Other minerals already being exploited include gold, of which the output was described in 1956 as having been " increased five and a half times in the last five years " ;. alabaster, chalk and marble.

Additionally, there have been located, as the result of a geological survey which is still uncompleted, reserves — sometimes described as " considerable " — of silver, iron, manganese, tungsten, copper and various other non-ferrous metals ; of graphite, asbestos and gypsum ; and of marble, granite, alabaster and quartz (suitable for glass-making). These are situated, for the most part, in the Hangai and Hentei mountains, on the northern frontier of the Republic, where it borders on the USSR, which were known formerly to be rich only in a variety of semi-precious stones, such as white rock crystal, turquoise, yellow and various coloured topaz, garnets, and tourmaline, and in fluorite. Some oil is reported to have been located, but no indication is given as to the positions or the amounts of these discoveries. The survey is being conducted with the help of geologists from the USSR, who are training Mongolians to take over their work.

It is difficult to forecast the speed with which, or the scale on which, these potential riches will be exploited, but it may be noted, in this connection, that the industrial output of Mongolia, which includes that of the mines, having gone up by 43 per cent under the Second Five-Year Plan (1953-1957), is to go up progressively under the current Three-Year Plan (1958-1960) by a further 53 per cent, and that " capital investment," of which a substantial part may be presumed to relate to the mines, has been an important item in the annual budgets of the Republic throughout the period covered by those Plans.

*Russian Metal Industries—II*

# MATERIALS FOR RUSSIAN STEEL

*The article appearing herewith concludes our remarks on the Russian metals industries. It is, perhaps, significant that the U.S.S.R. is the only iron and steel producing nation with large resources of the principal raw materials*

ACCORDING to Alexander Gakner in his article on the "Battle for Steel Supremacy", the Soviet Union, in the 30 years since the inception of the Five Year Plans in 1928, has increased steel production 15 fold from less than 4,000,000 tons to over 60,000,000 tons. Under the present Seven-Year Plan, the output of steel is planned to increase to over 95,000,000 tons.

To produce this amount of steel vast quantities of ingredients will be required, but the U.S.S.R. is, in fact, the only significant iron and steel producing nation with large resources of the principal raw materials—iron ore, coking coal, manganese ore and chromite—within its own borders. Russia's reserves and production of nickel are, however, limited and the supply situation tight. Domestic production of molybdenum and tungsten is supplemented by sizeable imports from Communist China and probably North Korea. The U.S.S.R. appears to be self-sufficient in vanadium, titanium and columbium, but dependent on China and Mongolia for much of its fluorspar and importing some magnesite from China.

## Iron Ore Reserves

According to Soviet sources, the total iron ore reserves in the U.S.S.R. at January 1, 1956 were estimated at nearly 58,000,000,000 tonnes, about one-half being proved. This tonnage, including nearly 9,000,000,000 tons of titaniferous iron ore averaging less than 25 per cent iron and over 25,000,000,000 tons of taconites, was claimed to represent about one-quarter of the world's reserves. The proved ore reserve is referred to as the industrial or explored reserve and forms the basis for future planning, its average iron content being 36 per cent.

On December 30, 1958, the Soviet Minister of Geology and Conservation wrote in *Pravda* that the explored Soviet iron ore reserves had reached 38,000,000,000 tons, but, if low-grade ores were included, the total reserve would be at least 115,000,000,000 tons. About 40 per cent of the contained iron in the reserves is in taconites, 25 per cent in limonites and about 10 per cent each in magnetites, hematites and titanomagnetites.

Soviet estimates of about a year ago placed coal reserves, including anthracite, bituminous and brown coals, at nearly 8,700,000,000,000 tonnes or more than half the world's total, but 60 per cent is located in permafrost areas of Siberia, north of the 60th parallel, and over half of the reserve has an overburden exceeding 2,000 ft. Commercially exploitable coal reserves are, at present, said to be only about 1,000,000,000,000 tonnes.

The total reserve of straight coking coals at the principal coal basins in the U.S.S.R. is about 60,000,000,000 tons, but only about one-third of this can be mined economically today. On the other hand, the Russians claim that over 20 per cent of the total coal, when properly blended, is suitable for producing coke. Reserves of coking coals are, in fact, considered adequate to satisfy all anticipated needs.

In respect of manganese ore and chromite, the Soviet Union boasts the world's largest reserves but for the past 20 years little data has been published to substantiate this claim. Pre-World War II figures put commercial-grade manganese ore reserves at 800,000,000 and reserves of chromite, mostly refractory grade, at more than 30,000,000 tonnes. These figures have probably been increased since by exploration. Production of manganese ore at nearly 5,000,000 tons annually and chromite at over 800,000 tons annually satisfies all domestic needs and provides for substantial exports.

The pig-iron to crude steel ratio in the U.S.S.R. is 0.73 or more and the use of scrap is relatively low.

While Mr. Gakner does not consider that any of the major Soviet iron and steel problems are insurmountable, he believes that there will be greater effort and smaller returns per investment rouble. While three-quarters of Russia's industrial output comes from the Ural and European regions, 90 per cent of the coal reserves, including two-thirds of the coking reserves, lie east of the Urals. The average sulphur content of all metallurgical coke used in the U.S.S.R. is 1¼ per cent and blending has to be done with coals from different basins since the coals in any one basin are not complementary. The geographical distribution of iron ore is more favourable, but while the high-grade reserves of the Krivoi Rog area (the chief source of supply) are still large, very deep mining is necessary and there is a serious ground water problem. Thus, the production of concentrates from taconites found elsewhere can now compete favourably with high-grade Krivoi Rog ores.

To alleviate the unfavourable geographic distribution problem the Soviet Union plans to expand the Cherepovets plant near Leningrad and adapt it to the greater use of scrap and to develop a third metallurgical base in Asia between the Karaganda coal basin in the west and Lake Baikal in the east.

Labour supplies are also likely to be a continuing problem in the U.S.S.R. and to achieve better production from the labour available, obsolete plants are gradually being replaced as investment resources are made available. Because of mining wage increases (reflecting labour scarcity) which have outrun productivity, the decreasing quality of the mineral resources and the increasing amounts of money required to replace obsolete equipment and take care of normal depreciation, the Soviet investment rouble is bringing diminishing direct returns. During the past seven years, 42,000,000,000 roubles invested in the ferrous metal industry has resulted in a steel capacity gain of about 26,000,000 net tons. During the next seven years, a planned investment of 100,000,000,000 roubles is expected to yield increased capacity of 35,000,000 tons. This represents a gain of over 70 per cent in the unit cost of steel plant from 1,650 roubles per annual ton of steel capacity to 2,850 roubles.

## Technological Advances

The progress in technical education in the Soviet Union has, however, been phenomenal. In 1955 nearly 12,000 Soviet engineers graduated in mining, geology and metallurgy, representing about one-fifth of the total engineering graduates in Russia that year and nine times as many as graduated from U.S. colleges. Russia has at least 12 schools where a degree in a highly specialized branch of ferrous metallurgy can be obtained.

# ARE WE MAKING THE BEST USE OF OUR GRADUATES?

THE student graduating with a degree in mining engineering cannot, of course, consider himself to be a qualified mining engineer, He should have by then a reasonably sound training in the theoretical aspects of his profession but, until he has gained experience of the application of theoretical training to practical conditions, he is not an engineer. This stage of his education presents many problems.

First, mining engineering and management are two quite distinct fields. Mining engineering is concerned with the application of science and technology to the solution of technical problems. Management, whether at the level of the mine manager or the shift boss, is concerned with the supervision and leadership of the working team and with the co-ordination, control and direction of their efforts and activities. Ability, experience, skill and knowledge in the two fields do not overlap to any marked extent, although they are complementary.

A formal education in engineering cannot provide of itself training in management, and should not attempt to do so, although the opportunities are available in university life outside the lecture theatre for students to develop a capacity for leadership and allied social skills, in the corporate life of the university. A man of high intelligence tends, of course, to develop a capacity for leadership more easily than a man with less intelligence. This is borne out by the experience that it is usual to find that students who are most active in, and provide the leadership for, extra-curricular activities have good academic records. But the converse does not apply. There are many students with first-class academic records who show no ability or desire to compete in fields where leadership qualities are at a premium. Thus by no means all of the best graduates in mining engineering entering the industry do so with the intention or the ability to make their way to the top through the field of executive management.

### No Recognized Channels of Promotion for the Specialist

Unfortunately, at the present time there is little opportunity for graduate mining engineers to advance in their profession unless they are willing to enter the production field, to make their mark as potential leaders, and so to enter the field of management. All other avenues, such as survey, ventilation, planning or work-study, both on the mines and to a large extent in head offices, are generally regarded as inferior to production and relatively unimportant. Good graduates do not normally, therefore, contemplate making a career in any of these fields. In consequence, these departments are not staffed with many technically trained men, nor are they staffed or equipped on a scale to enable them to engage in the type of work which is likely to be attractive to good graduate engineers.

The accent then, as far as the graduate mining engineer is concerned, is on the production side, and a high premium is put on gaining practical experience in this field. The tendency is thus for all graduates to enter or be directed into production. For those with the personality and make-up to develop into managers, no harm is done. But for those with technical, rather than managerial abilities, the effect is often disastrous. They are thrown into a fiercely competitive school for which they have little natural aptitude. They find it difficult to achieve success, and experience deep frustration because there is little or no outlet for the exercise of their technical ability, which they have spent four years at the university in cultivating.

In the production field it is a case of " get on or get out ", and these young men " get out " in distressingly large numbers. Finding themselves unsuited to the hurly-burly round of production, they look about them, see no worth-while alternative within the mining industry, and so get out—right out—and are lost to the profession of mining engineering completely.

That the problem is a real one I have no doubt. Young graduates frequently discuss with me their experiences in the industry after they have left the university, and their constant complaint is that the engineering skill and level of knowledge which they have acquired at the university finds little scope in the work they find themselves doing on the mines. They complain that they are merely asked to do routine production jobs, which are better done by other people with less training but more experience than themselves.

### Technical Specialization Vital to Higher Efficiencies

One is then led on to ask the next question. Does this happen because there are no technical or engineering problems, and because no study, planning or design work on which young engineers could be profitably employed are necessary in mining? There is plenty of such work and there can be little doubt that mining graduates would be better employed, most of the time, doing it than in " chasing out the tally " in routine production.

The mining industry needs highly-qualified engineering specialists in many fields, including specialists in:— rock mechanics and the design of workings and support; explosives and breaking ground; work study and planning; ventilation engineering; mechanical handling equipment; ore valuation; surveying and the design of mining layouts; and probably many other fields. Experts in these subjects, of course, do exist in the industry; but in most fields they are few and far between. The technical standards and efficiency of routine operations could be raised if better services of the sort indicated were more readily available to the production staffs of individual mines.

These paragraphs are not to be construed as a suggestion that a mining engineer can or should become a manager without passing through the junior stages of production experience. But the purpose and method of his passing through the junior stages require critical examination. The manager of any organization should be familiar with the conditions and problems of all phases and levels of the work for which he is responsible. But, to take an extreme example, no one supposes that it is necessary for the medical superintendent of a large hospital to have scrubbed the floors in the wards before he is fitted to take over his responsibilities as superintendent.

On the mines the jobs of shift boss and mine captain, and even junior underground manager, should be regarded for graduate mining engineers as training posts and as an opportunity for them to display and develop the ability to lead, and latent managerial capabilities. How long should a graduate need in these jobs to learn all he can from them? The answer must surely be in the form of convergent infinite series. At first the sum of his knowledge and experience will be increased very rapidly with time, but later each extension of time will make a smaller and smaller contribution to the final sum. Although the limiting size of the final sum of knowledge and experience and the time taken to approach the limit with reasonable proximity will vary widely with different individuals, the following suggestions are made. A

**We have on various occasions in these columns discussed the twin problems of the recruitment of graduates into the mining industry and of the utilization to best advantage of the inadequate numbers, which on average have been coming forward since the war. An important contribution to the latter problem is contained in the concluding portion of a paper presented in April to the South African Institute of Mining & Metallurgy by R. A. L. Black, Professor of Mining at Witwatersrand University. Professor Black's paper, entitled " Education and Training in the Mining Industry ", has been prepared as the opening contribution to the Institute's Symposium on this subject which provides the theme of the Institution's discussions during the coming winter meetings. Some of the implications of what Professor Black has to say about a problem, which is common to mining everywhere, are discussed in this issue** **on page 427**

man with management potential in him will approach the limits within 10 per cent after six months as a shift boss, and after nine to eighteen months as a mine captain or junior underground manager. (The two jobs are essentially similar, if the mine captain's responsibilities are commensurate to the scope allowed for in the mining regulations.)

### How Not to Waste the Graduate's Time

How then is it suggested that young mining graduates should be employed and trained for their future responsibilities when they enter the industry from the university?

First, as is at present done, they should be given the opportunity of finding their feet and gaining general experience in the various departments, including practical production training. The time taken for this will depend on the amount of practical experience the young graduate may already have acquired before going to the university and during vacation work. He should then be encouraged to specialize in a field of technical work in which he shows particular interest or ability, or where the need is great. The appropriate service department can then be his principal home, for the early stage of his career, and he should only be taken from it for specific training periods on production and in other fields into which it may be desirable to broaden his interests and training.

He should be given the necessary six months' experience as a shift boss as soon as he is ready for it, which is largely a question of individual maturity, to enable him to sit for the mine managers' certificate. After the necessary period of practical experience on production as a shift boss, he can return to his specialist department and will be ready to assume in it a responsible, if subordinate, position.

Further periods of service in production as a mine captain or a junior underground manager can then determine where the future of the young graduate lies: in continued technical specialization, or in production and management leading him towards senior executive positions. If he is found to be suitable for training for management, this is the stage at which true management training should begin, and it should include long periods as an underground manager on production, and periods of experience as a technical assistant in head office or to the mine manager and on special work. It should also include formal study in industrial engineering and other management subjects, which may take the form of attendance at courses within the group or the industry, and post-graduate study at a university or other institution of higher education.

Those who do not find themselves specially suited to management should be encouraged to make their careers within the fields in which they have already chosen to specialize. There will be scope for them there to exercise their ability in a technical direction and to become expert at it. Their work will be the real work of an engineer and they will find complete fulfilment in it. The functional services, if properly staffed and fully engaged on technical work of a high calibre, can achieve the prestige and status in the scheme of things to which their importance entitles them, and they will then become attractive to graduate engineers.

### Need for the Consultant Divorced from Management

In this connection it is certainly true of the mining industry at present that the ratio of thinkers and planners to production supervisors is much lower than in other engineering industries.

Parallel with the growth of technical services on the mines must come an expansion of the consulting services available to the mines from head offices. This expansion is already taking place, and as the application of modern technology to mining proceeds, they must necessarily expand further. One can foresee a steady interchange of personnel in the technical departments between head offices and the mines, the final goal for the technical engineer being his appointment as head of his specialist department in head office, a consulting engineer in the true sense of the word.

Much has already been done by some sections of the mining industry along the lines suggested in the previous paragraphs. Many young engineers are given scope to develop their interests and abilities by being put to work on special investigations on the mines and by periods of experience and training in group head offices. But, unfortunately, what is being done does not appear to be widely known to the groups of people who are most directly interested, the young graduates themselves. Changes of practice in the employment of graduates in the industry of this type should be widely publicized within the mining industry and to the general public. One of the basic reasons why mining is unpopular among many of the best potential recruits to the profession of engineering, is the belief that it offers little scope for brains and technical ability and much opportunity for brawn and drudgery.

Finally, has the university any part to play in post-graduate training? We believe that it has. A university department of engineering has four principal functions to perform:

(1) Its most important task is to train engineers at the undergraduate level to serve, after practical training in industry, as professional engineers;

(2) It should contribute, by its research activities, to the advancement of knowledge and practice in its own engineering field;

(3) It should be able to carry the formal training of its best graduates to a level beyond the first degree in appropriate fields which will be of importance to them in the practice of their profession; and

(4) It should be able to offer training through the medium of its own research activities in the methods of research.

We at the university have only one overall aim: to serve the best interests of the profession of mining engineering, of which this institute is the South African headquarters. In serving the profession in the field of educating and training student engineers, we are building for the future, and we must be prepared to take bold and hopeful steps into the unknown. If we are timid, we shall run the risk of training engineers who will, in the years to come, be faced with the problems of the twenty-first century and equipped to tackle those of the nineteenth.

# Up Draught Zinc-Lead Sintering

*By R. M. Sellwood, sinter technologist Imperial Smelting Processes Ltd.*

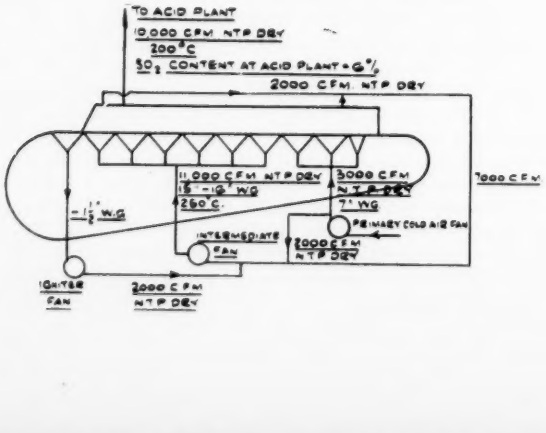
SULPHIDE sintering of zinc, lead, or mixed zinc/lead concentrates or ores, and subsequent production of sulphuric acid from the high $SO_2$ tenor gases produced, requires that maximum utilization of the air and gas volumes available must be practised in order to produce these high $SO_2$ tenor gases, and to this end The National Smelting Co. Ltd. developed the technique of recirculating weak gases on their downdraught sinter machines. This involves the taking of the gases from the discharge end of the machine where the elimination of sulphur is almost complete and consequently the $SO_2$ tenor of the gas is very low, and passing it once again through the sinter bed closer to the feed end of the machine, to increase the $SO_2$ tenor of the gas which is then used for sulphuric acid production. Because of the successful application of this technique it was again applied when one machine was converted for updraught sintering of mixed zinc lead materials. Although this conversion to updraughting satisfactorily overcame such problems as lead fall in the windboxes and excessive burning of pallet bars, some new problems were encountered. These new problems included the handling of recirculating gases at a comparatively high temperature and pressure drops across the sinter bed higher than envisaged.

## Layout and Operation

The layout and operation of the updraught sinter machine at the Avonmouth Works of The National Smelting Co. Ltd., has been described in a paper given at the Port Pirie Sintering Symposium in 1958.(i) The circulating gas system originally in use was such that temperatures of the recirculated gas in excess of 300 deg. C. were obtained and to save power and protect the mild steel fan in use, cold air was admitted to the system to keep this gas temperature below 250 deg. C. The higher temperature of the recirculating gas was thought to be at least part of the cause of the excessive pressure drop across the sinter bed, i.e. 14 in.- 18 in. w.g. These high-pressure drops had been encountered from the commencement of updraughting, and means of reducing the temperature of recirculating gases were investigated.

The first idea for reducing the recirculating gas temperature was naturally the injection of water on to the hot sinter bed or into the hot gas main, but corrosion and gas cooling

**Fig. 1. Conventional updraughting gas circulating system**



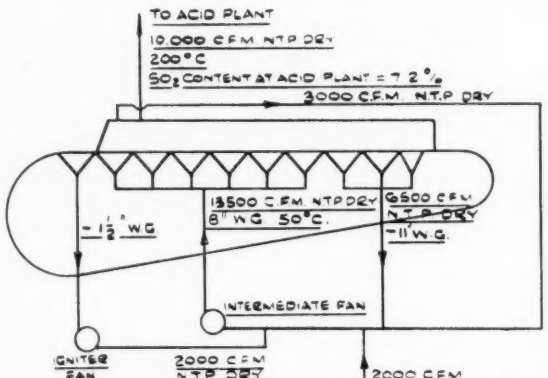




**Fig. 2. Updraught-downdraught gas circulating system**

problems which would be encountered later in the system caused this app oach to be abandoned. Voice and Wild (ii) have shown that during sintering a number of zones (e.g. heat and combustion) tra el through the sinter bed. From the experimental work carried out by Voice and Wild together with practical observation of a sinter bed, it can be seen that although the very hot zone gradually increases in thickness during sintering, when the flame front reaches the top of the sinter bed, at least the bottom half of the bed is quite cold with all the heat concentrated in the top section, and it was argued that the cold section of the sinter bed itself could be used as a heat exchanger for cooling the recirculating gas.

When the flame front reaches the top of the sinter bed, if the draught is then reversed, any sulphide particles which have been ignited but not roasted would continue to roast to completion under the influence of the downdraught. The heat from the burning sulphide, together with the heat in the hot zone, would be used to heat the cold section of the sinter cake, and the gases leaving the sinter bed would be much cooler, whilst the maximum temperature of any sinter in the bed would be reduced due to spreading of the hot zone in the sinter cake. To put this development into practice, the primary air fan supplying fresh cold air to the discharge end wind-boxes was taken out of circuit and the intermediate fan (recirculation fan) connected to both the updraught and downdraught sections of the sinter machine. Figures 1 and 2 show the gas recirculating systems used and the pressure drops across the sinter bed in both cases.

## Increased Draught Intensity

From figures 1 and 2 and the table it can be seen that by introducing the downdraught technique at the tip end of the machine the gas recirculating temperature dropped from 250 deg. C. to 50 deg. C. and that the pressure drop across the updraught section of the bed was reduced from 16 in. w.g. to 8 in. w.g.; at the same time the original draught intensity through the sinter bed was increased. Because of this increased draught intensity at a lower pressure drop across the sinter bed, not only was it possible to pass a larger gas volume through the bed per square ft. of grate area, but less air by-passed the sintering bed, thereby utilizing the gas volume more efficiently. Consequently the sulphur elimination rate was increased from 0.10 to 0.12 tons of sulphur per day

**General Comparison of Results Between Conventional Updraught and Updraught/Downdraught Sintering Techniques When Producing Sinter Containing 40% Zinc — 20% Lead**

| *Method of Working* | *Period* | *Average Total Sulphur in Output Sinter (%S.)* | *Average acid make (Tons 100% $H_2SO_4$/24 hrs* | *Gas Volume to Acid Plant (c.f.m. N.T.P. dry)* | *Volume to Intermediate fan (c.f.m. N.T.P. dry)* | *Recirculating Gas Temp. (°C.)* | *Cadmium Elimination (% of feed mix)* | *Sulphur eliminated (Tons/ft.² per 24 hrs.)* | *Recirculated Gas Pressure Drop Across Sinter Bed (ins. w.g.)* |
|---|---|---|---|---|---|---|---|---|---|
| Conventional Updraught | January 1959 | 1.1 | 102 | 10,000 | 11,000 | 250 | 80 | 0.10 | 15-16 |
| Updraught/ Downdraught | March 1959 | 1.1 | 123 | 10,000 | 13,500 | 50 | 65 | 0.12 | 8 |

per square ft. of grate area and acid production increased from approximately 102 tons per day to about 123 tons per day of 100 per cent sulphuric acid, i.e. with a gas volume of 10,000 c.f.m. N.T.P. (dry) to the acid plant; a gas strength of approximately 7.2 per cent $SO_2$ at the acid plant. When sulphuric acid is recovered from sinter machine gases produced by utilizing the sulphide as fuel, in general every attempt must be made to increase fuel burning rates, thus giving a higher tenor of $SO_2$ in the gas and reducing the size of equipment required, whereas in the case of iron ore sintering fuel economy must be sought as fuel under this latter circumstance is very costly.

The average temperature of the sinter produced by this draught reversal method is naturally somewhat higher than with conventional updraughting, but the maximum temperature of the sinter cake is lower due to the more even distribution of heat through the sinter cake. This is an advantage with the Imperial Smelting Furnace which simultaneously produces zinc and lead and for which the updraught sintering method at Avonmouth was developed. It is desirable to charge hot sinter to the furnace, and sinter having a high average temperature with the lowest possible maximum temperature is preferable as it reduces fuming and eases as much as possible the problems associated with handling hot sinter.

As well as producing sinter of the required physical state and the correct chemical analysis, at the same time utilizing all the sulphur eliminated for high-grade acid production, the sinter machine also eliminates an appreciable proportion of the cadmium present. When using the all-updraught method, cadmium elimination during sintering is over 80 per cent and cadmium content of output sinter is approximately 0.07 per cent Cd. With the reversed draughting technique, however, cadmium elimination rates could not be maintained at this high figure and cadmium content of output sinter increased to 0.11 per cent Cd. For this reason operation has reverted to all-updraughting.

It is true to say, however, that during the short period of draught reversal operation, the main aim was to reduce recirculating gas temperatures, and if possible increase the sulphur elimination rate from the machine. Because of this latter aim the machine speed was maintained such that the draught through the bed was reversed immediately the flame front reached the top of the bed, and this did not allow a sufficient margin to complete the elimination of the cadmium. It is planned, however, that further test work will be carried out to improve this lower cadmium elimination as although the cadmium elimination achieved with all-updraught is unlikely to be bettered, there is no reason why a comparable elimination figure should not be achieved by this new method.

In the meantime, having observed the beneficial effects of low recirculating gas temperature, alternative methods of reducing this temperature are being sought, in order to minimize the pressure drop across the sinter bed and increase draught intensity with resultant increases in sulphur elimination rates.

REFERENCES

(i) A. V. Broad and D. A. Shutt, "Sintering Practice at the Avonmouth Works of Imperial Smelting Corporation Ltd.", Australian Institute of Mining and Metallurgy 1958 (Sept.) Paper No. 3 Port Pirie Symposium.

(ii) E. W. Voice and R. Wild, "The Influence of Fundamental Factors on the Sintering Process", Australian Institute of Mining and Metallurgy 1958 (Sept.) Port Pirie Symposium.

# FERROUS METAL PLANS IN ASIA

NEWS has been issued of three new ferrous metal projects in the Far East. All are based on the use of Asian raw materials and all will have the result of cutting imports to the Asian area.

The Government of the City-State of Singapore is planning, with financial aid from the World Bank and from Japanese interests, to erect a steelworks which will consume iron ore mined in Malaya itself and coal from nearby Indonesia.

A loan from the World Bank of $600,000,000 Malayan or some £70,000,000, is expected for the project. Indonesia will be among the consumers of steel produced at the plant, as local demand will not be sufficient. Auxiliary plants are also planned to be set up in Singapore for the products of finished and semi-finished steel products for export. Representatives of the Japan Steel Industries Federation and the Kawasaki Iron and Steel Co. arrived in Singapore at the end of March to hold negotiations with regard to the planned plant.

In the Crown Colony of Hong Kong the erection of a steel plant is projected, in this case with Japanese and with local Chinese capital. This plant is planned to have an eventual annual capacity of 50,000 tonnes of rolled steel, although in the first year output levels will not exceed an equivalent of 9,600 tonnes annually. The plant will work exclusively with scrap from the local shipyards, while coal is expected to be imported from Communist China. The interests behind the scheme are Fuji Iron and Steel Co. Ltd., of Tokyo, on the one hand, and Hong Kong Metal Enterprises on the other.

The third scheme is in the Communist-dominated part of the Far East. This is for the expansion, by plans designed by Russian experts, of the Kim Chaik iron and steelworks in Chongjin, North Korea. A new rolling mill in the ferrous-metals combine is to be erected for the production of welded tubes, cold-rolled sheets, galvanized sheets and plated iron sheets. Plans announced earlier foresee the addition to the combine of a 400,000-tonnes-a-year convertor steel plant, operation of which would raise the plant's total capacity to 600,000 annual tonnes.

*Machinery and Equipment*

# Vibrating Equipment at Coal-Handling Plant

Practically the whole of the vibrating equipment used in the coal-handling plant at Willington "A" power station of the East Midlands Division of the Central Electricity Generating Board has been supplied by The General Electric Co. Ltd. The plant includes 48 Sherwen electromagnetic vibrators, 18 Sherwen electromagnetic feeders and two 8-in. diameter Sherwen electromagnetic conveyors, the total value of the contract being over £19,000. The coal-handling plant is to serve both "A" and "B" stations and is of particular interest due to the sticky nature of the coal being burnt at the station. The total installed capacity of Willington "A" power station consists of four 100 MW sets, the final unit having been commisssioned a few months ago. Work is proceeding on the "B" station which, when complete, will have two 200 MW turbo-alternator sets.

Coal is delivered either by road or rail, and is of rather poor quality, consisting in the main of 2 in. to 0 slack, to which is added a percentage of slurry. The moisture content may at times be of the order of 25 per cent, and, in consequence, the coal is extremely difficult to handle.

Railborne coal is delivered to four side-tipping wagon tipplers. Three Sherwen M.S. 2. B vibrators are fitted to each wagon tippler beam. Each tippler is associated with a bunker fitted with twin outlets from which coal is taken by means of two 60 in. by 7 ft. Sherwen heavy-duty feeders, and discharged on to two 48-in. conveyors running transversely beneath the tippler house.

The eight Sherwen feeders have a total coal-handling capacity of 2,000 tons per hour which is well in excess of the 700 tons per hour required when both "A" and "B" stations are fully commissioned.

The twin conveyors discharge on to twin inclined 48-in. belts which take the coal to the top of the main transfer tower. From this point the coal is either fed direct through a by-pass chute into the main transfer bunker or through four mechanically-operated screens. The undersize from the screens goes into the main transfer bunker, but the oversize is directed through two hammer mills before entering the main transfer bunker. This bunker is provided with four outlets under which are situated four 60 in. by 10 ft. twin-vibrator heavy-duty Sherwen feeders, each feeder being capable of handling coal up to the required station maximum of 700 tons per hour.

From the same tower, twin 36-in. conveyors transport the coal to the station tower where it is passed through refuse screens before being conveyed to the station bunkers.

The other two Sherwen feeders in the transfer tower discharge on to a 48-in. belt which conveys the coal to the top of the intermediate junction tower. From here a 60 in. by 10 ft Sherwen feeder directs the coal to a 48-in. reversible belt which passes through the reclaim tower on its way to the boom stacker in the stockyard. Roadborne coal is delivered directly to the stockpile.

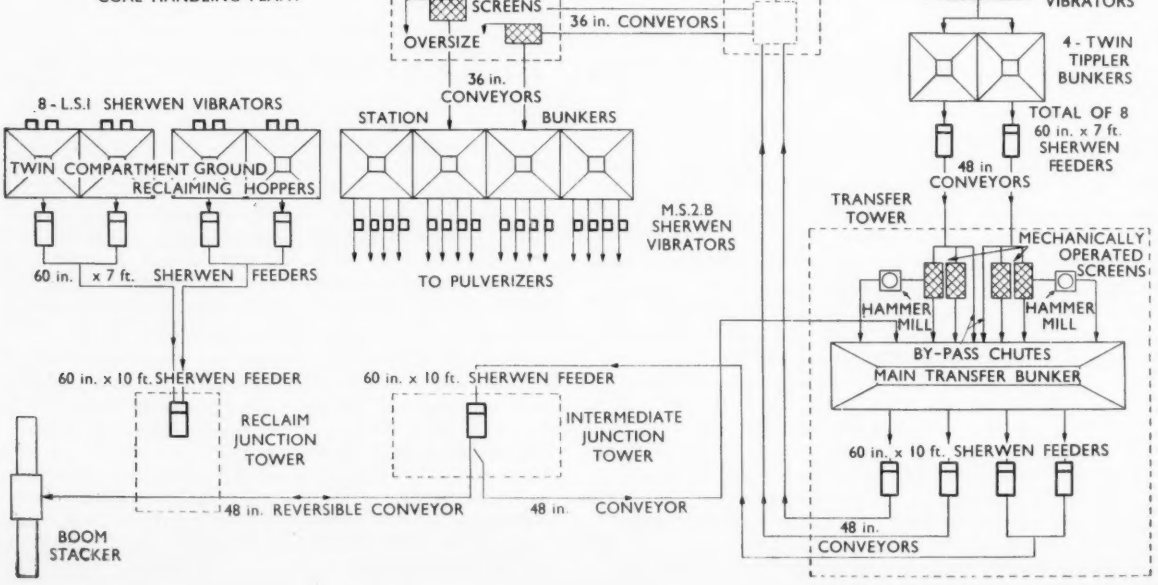
Coal is reclaimed for use through two ground reclaiming hoppers fed by bulldozers. Each hopper, which is divided into two compartments, is covered with a heavy steel grid with 6-in. square apertures. Each grid is placed on suitable flexible mountings and is vibrated horizontally by four Sherwen heavy-duty L.S.1. units. This is the first time that these vibrators have been used for such an application.

A 60 in. by 7ft. Sherwen heavy-duty feeder, capable of handling coal up to a maximum rate of 350 tons per hour is fitted beneath each outlet of the reclaim hoppers. These feeders discharge on to a 48-in. belt which conveys the coal to the reclaim tower. From here a 60 in. by 10 ft. Sherwen feeder directs the coal on to the 48-in. reversible conveyor ruuning between the intermediate tower and the boom stacker. This is arranged to discharge the coal, via a chute, on to a 48-in. conveyor, which then transports the coal to the main transfer bunker.

A small sampling plant is situated in the main transfer tower and employs two 8-in. diameter Sherwen conveyors, one 6 ft. and the other 10 ft. long, each of which handle small coal at the rate of 5 tons per hour.

Main contractors for the coal-handling plant were New Conveyor Co. Ltd.

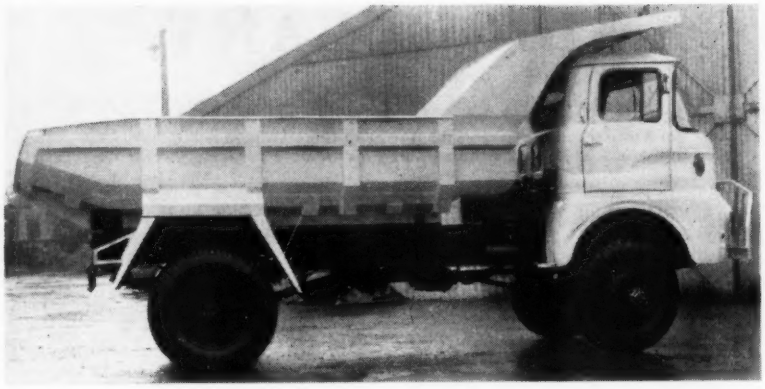
**Flow diagram of the coal handling plant at Willington "A" power station showing the disposition of the Sherwen electromagnetic vibrating equipment**




## A.S.E.E. EXHIBITION

The Association of Supervising Electrical Engineers' exhibition was held at Earls Court from April 5-9, 1960.

Among the exhibitors, Victor Products (Wallsend) Ltd., showed a new product, the Victor 125 Watt flameproof lighting



**Above is the new Abelson four by four struck cap, steel bodied, scow-ended diesel dumper. The body has high capacity and low centre of gravity**

fitting and control gear for mercury discharge lamps. Designed primarily for use in mines under Group 1 conditions, but can be supplied for use under Group 2 where specially requested. The assembly consists of a robust pendant type well-glass lighting fitting connected to the control gear, housed in a separate enclosure mounted above the fitting. Arranged with 3 slot B.C. lampholder for mercury flourescent discharge lamp type MBF/U.

The Victor electric hammer drill and range of operating tools were also exhibited.

Brush Electrical Engineering Co. Ltd., a member of the Hawker Siddeley Group, has supplied industry and public service organizations with a wide range of electrical equipment for many years. The products manufactured include power and distribution transformers, on-load tap-changing gear, a.c. and d.c. motors and generators, h.t. and l.t. switchgear, distribution gear, fusegear, H.B.C. fuses, diesel electric locomotives, traction equipment, and busbar trunking.

A number of items from the range were on show at the exhibition. The Switchgear Division showed a double-busbar, compound-insulated, type VBCD, metalclad switchgear unit of 1,600 ampere rating, a single-busbar, air-insulated, type VGA, metalclad switchgear unit of 1,200 ampere rating, a type HF11, high-voltage, switch-fuse unit of outdoor construction, fitted with metering current transformers and voltage transformer, a fuse-link display indicating a wide range of applications, and British Canalis busbar trunking which is available in two types, the Universal for ratings 200-600 amperes, and heavy current for ratings 600-3,500 amperes.

The Transformer Division showed transformers in a range of sizes up to 60 MVA and 154 kV.

Other divisions showed a.c. and d.c. motors and generators, static excitation equipment for automatic voltage control employing the Brush Rectifex system of control, and special exhibits in the motor and transformer fields.

## A NEW DUMPER

Abelson and Co. (Engineers) Ltd., announce a new vehicle with 4 x 4 (front and rear axle) or 4 x 2 (rear axle) drives. The unusually low body is of Abelson design. The new vehicle, described as a four by four 5 cu. yd. struck cap, steel-bodied, scow-ended diesel dumper has already been supplied to a nationalized industry.

The aim of the new design was to provide a vehicle with additional traction, still further widening its on-and-off-the-road use; with the lightness and strength factor retained and with a body of smoothly contoured interior for ease of discharge but with nothing lost in capacity thereby and gave the whole vehicle a low centre of gravity. The 60 deg. angle of tip is achieved by 15 ton capacity heavy duty twin rams, and body capacity is 4½ cu. yd. struck and 5 cu. yds. heaped, and 8 tons payload when operating in 4 x 2 drive.

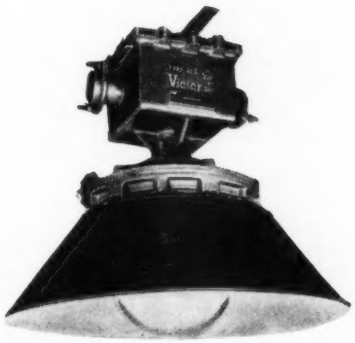
In all the new dumper represents a multi-purpose vehicle for fast haulage coupled with the facility of operation on rough ground.

## CABLE RACKING SYSTEM

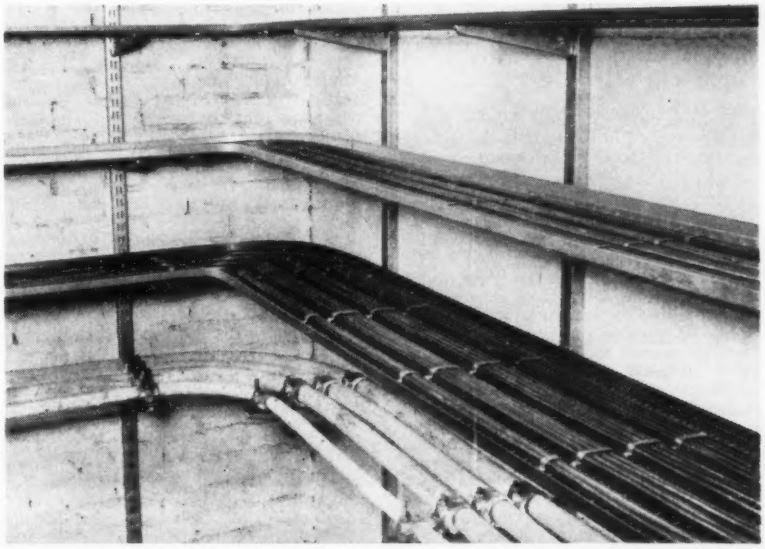
A new cable racking system, extremely flexible and claimed to cut installation costs considerably in comparison with other methods, has been introduced by Savage and Parsons Ltd. The system is based on the Spur adjustable shelving system, but uses modified Spur components and a number of special fitments specially designed for racking so that the heaviest types of industrial and power cabling can be carried with safety.

It consists, basically, of wall-mounted uprights of mild steel channel with slots at regular intervals in the face into which fit cantilever brackets ranging in size from 5 in. to 18½ in. To make an island site, double-sided uprights can be formed by bolting two slotted channels together and fixing at floor and ceiling with heavy-duty sockets. A simple bolting system on the brackets fixes standard cable trays, or holds a Spur top plate to which standard cable clamps or cleats can be fitted. The height of the bracket can be adjusted easily by inserting the holding lugs into other slots in the face of the upright.

The safe load for each bracket ranges from 280 lb. for the 5-in. to 160 lb. for the 18½ in., but considerably greater loads can be carried by using a Spur supporting strut, it is claimed.



**Above, the Victor 125 watt flameproof lighting fitting and control gear for mercury discharge lamps. Below is an installation using some components of the Spur cable racking system**



# MINING MISCELLANY

An American-Dutch expedition leaves New Guinea this week for the Carstenz mountains in search of copper and gold. The expedition, organized by American Freeport Sulphur Co. and the Dutch Oost Borneo Maatschappij, is to last four months.

★

The Indian Copper Corporation has been licensed by the Government of India to set up an electrolytic copper plant with a capacity of 8,000 tons. Site is at Ghatasila.

★

According to the Israel Ministry of Development, the Timna copper works exported $3,300,000 worth of copper in the fiscal year ended March 31, 1960. This was the first year of normal production. It is hoped to increase output by 15 per cent during this year to a total output of 6,500 tons of metallic copper.

★

Fifteen miners and an engineer from the U.K. have arrived in Eilat, Israel, to work in the Timna copper field and to train Israelis in underground mining.

★

Barclays bank D.C.O. reports from Kampala the Uganda's Geological Survey Department recently carried out an aerial survey for radioactive minerals over the Northern Karamoja district. A scintillation counter loaned by the U.K. Atomic Authority was used in the survey.

★

A new holding company is to be set up to control the development enterprises of Israel, such as Timna copper works, Dead Sea potash works and Negev Phosphates Co.; The public will be offered shares.

★

Estimates issued by the Japanese Ministry for International Trade and Industry indicate that Japanese lead output in the period April 1, 1960, to March 31, 1961, will be some 138,900 tonnes. With an estimated national demand of 228,100 tonnes, the Ministry will allow import quotas of some 9,600 tonnes, and Japan will cover the outstanding demand from old lead stocks.

★

A delegation of the World Bank, recently arrived in Israel, is to discuss the expansion of the Dead Sea potash works.

★

The first series of experiments with the fast-breeder reactor at Dounreay (Caithness) will be completed this week. The reactor will then be shut down for about three months while changes are made in the "core" of the reactor so that a wider variety of types of fuel can be tested. As an experimental tool, the Dounreay reactor has been designed so that minor and major components may be easily replaced when different designs have to be tested.

★

Under the terms of a Polish - Cuban trade agreement signed in Havana recently, Cuba will export copper, iron, nickel, chrome and manganese to Poland.

The Peruvian Government has empowered the governmental Corporacion Peruana del Santo to renew the concession granted to the U.S. Marcona Mining Co. which exploits iron ore deposits of the same name in Southern Peru. As a result, Marcona Mining Co. will now be able to carry out its $25,000,000 expantion programme. This programme includes the construction of a concentration plant where low-grade ore will be treated with an initial capacity of 2,000,000 l.tons. This output can eventually be stepped up to 8,000,000 l.tons. The enriched ore can be used at the Chimbote steel works. The company also intends to build a second ore loading port with modern installations at San Nicolas in addition to its first port at San Juan. Both ports will be connected by belt conveyor to the mining area.

★

The deposit of 4 per cent beryllium, found last year by a government survey team at Jordan Falls, Nova Scotia, is to be evaluated by McIntyre Porcupine, although a spokesman for the company thought it unlikely to prove of economic importance to them.

★

According to *Stroitelnaya Gazela*, Russia's coal reserves are estimated at 7,500,000,000,000 tons.

★

A pilot plant for the underground gasification of low-quality brown coal is under construction near the town of Chomutov, in the North Bohemian brown coal basin. A small test generator, with a capacity of 3,000-4,000 cu. m./hr. has already been installed. This will be connected to a small electric power station with an output of 1.5 MW. By the end of 1961 it is hoped to complete a larger generator with a capacity of 20,000 cu. m./hr.

★

During 1959, Indian iron ore production rose to 1,903,000 tonnes, 29 per cent above the 1958 figure of 6,131,000 tonnes. All the producing States recorded an increase in production, Bihar and Orissa, among the largest, producing 3,229,000 and 2,581,000 tonnes respectively, with Mysore, 1,020,000, Madhya Pradesh 414,000 and Bombay 311,000 tonnes. During 1959 5,662,000 tonnes of iron ore were sent to Indian iron and steel plants, 61 per cent more than in 1958, while exports at 2,012,000 tonnes were 9 per cent higher than in 1958.

★

The Dominican Republic firm Explotacion Miner Hatillo has signed a contract worth $8,000,000 to supply West Germany with iron ore. The ore will be mined from deposits at Hatillo and shipped to Ferrostaal Import-Export of Essen. The initial order is for 840,000 tons of ore spread over three years, and this quantity is expected to be gradually increased. The first shipment of 25,000 tons will leave the port of Haina at the end of April.

★

The first of four new Polish iron ore mines to be sunk in Klobuck powiat, near Czestochowa, is reported to be nearing completion.

The Great Norwegian Spitzbergen Coal Co., has decided to stop production during the summer months owing to the unfavourable state of the coal market. The company expected to ship about 250,000 tons, and would have the amount available in store by the end of May.

★

A programme of drilling and trenching on Kangankunde Hill, in the Zomba District of Nyasaland where monazite has been detected, is expected to be completed by June, when it should be known whether extraction might be in economic proposition.

★

A new company, Sociedade Morro do Niquel, has been established in Brazil under the auspices of the Bank of Indo-China, to work and process nickel deposits owned by Mineracao Sertaneja S.A., in the State of Minas Gerais.

★

It is reported from Rabat that construction on a triple super-phosphate factory, costing approximately 10,000,000,000 Moroccan francs, with an annual capacity of 200,000 tons is scheduled to start this year, according to the Ministry of Economy's Mines Department. Production is expected to start in two years' time. The site for the factory Safi, is only 50 miles by rail from the Louis Gentil phosphate mines. Besides triple super-phosphate, the factory will also produce sulphuric acid, probably using pyrrhotite from the Kettara mine operated by the Cie. Miniere et Metallurgique of Casablanca. The project is to be financed mainly by the Office Cherifien des Phosphates, and by the government-owned Bureau d'Etudes et de Participations Industrielles, and European participation is also being invited.

## Personal

Cyanamid International announce the appointment of Mr. Herman Hartjens as technical representative for the mining chemicals department, with headquarters in Lima, Peru.

★

Mr. J. D. Zook has been appointed manager of the product development department of The Thew Shovel Co., Ohio, U.S.A., as from April 1, in place of Mr. Q. J. Winsor, who has retired.

★

Mr. J. Brailsford, formerly East Midlands Representative, has been appointed public relations officer of Padley and Venables Ltd. Mr. C. Jenkins has been appointed area manager, East and West Midlands Areas, while Mr. S. Whitefield, formerly Durham representative, has been appointed Scottish Manager, operating from 36 Dunster Road, Causewayhead, Stirling.

*Metals and Minerals*

# Consumption of Tungsten Expands

A significant recovery in the consumption of tungsten is indicated by the latest statistics issued by the Bureau of Mines, U.S. Departr..ent of the Interior, which cover the first eight months of 1959. During this period more tungsten was consumed in the U.S. than in the whole of 1958. The use of tungsten in various products during January - August, 1959, totalled 3,313 s.tons as compared with 2,777 s.tons for all of 1958. Consumption of tungsten concentrates for the whole of 1959 more than doubled the 1958 figure, amounting to 2,700 s.tons of contained metal. The leading supplier was Brazil.

While the outlook for tungsten metal is still regarded as obscure, many interests in the U.S. now look for a gradual improvement, reports *The Metal Market*. Although the U.S. ore market has been quite easy, a better picture is indicated by the fact that Haile mine in North Carolina will probably start operations in a month or more. It is mainly owned by Howe Sound Co.

The journal adds that, because of its refractory properties, tungsten may find increased applications in high temperature alloys and in the space programme, if more can be learned on how to roll and fabricate this tough, heavy metal.

A report from Canada states that large quantities of equipment are being airlifted to the tungsten property 130 miles north of Watson Lake in the Yukon Territories. (*vide The Mining Journal*, December 18, 1959, p. 628). This property has been described as one of the richest in the Free World, and Canada Tungsten Mining Corporation is preparing for production possibly by late 1961 or 1962. Limited drilling to date is reported to have indicated more than 1,000,000 tons of open pit ore, grading better than 2 per cent.

*

Although the wolfram ore c.i.f. European price has remained unchanged at 147s.-151s. per l.ton unit since the end of March, the undertone of the London market is currently looking rather more assured. A certain amount of business continues to be done and Japan is reported to have taken a useful tonnage in the past few days, part of which was supplied by the U.K. Sellers are inclined to await higher prices.

## CHROMITE BARTER DEAL

The U.S. Agriculture Department has proposed the barter of 78,000 tonnes of government-owned wheat for Turkish chromite. The Department announced that offers under the proposed barter would be received until 22.00 G.M.T. on April 15. The proposed barter is a revision of that announced on January 7, when an exchange of 80,000 tons of surplus wheat for Turkish chromite was suggested.

★

Total domestic consumption of chromite in January, 1960, gained 8 per cent over December, 1959, according to the Bureau of Mines, U.S. Department of the Interior. Chromite consumed for metallurgical purposes was up by 4 per cent, refractories by 16 per cent, and chemicals by 8 per cent.

## PLATINUM IN THE U.S.

Consumption of platinum - group metals in the U.S. in 1959, as indicated by sales to consuming industries, increased by 37 per cent to about 850,000 oz., according to the Bureau of Mines, U.S. Department of the Interior. Sales of platinum increased by 46 per cent, palladium sales by 31 per cent, and sales of iridium, osmium, rhodium and ruthenium together increased by 50 per cent over those of 1958. Imports of platinum-group metals in 1959 were 51 per cent above those of the preceding year.

The improvement was particularly marked in the fourth quarter, when sales of platinum by refiners and dealers to domestic consumers were 67 per cent higher than in the preceding quarter, with increases recorded in all the industrial categories. Palladium sales rose by 87 per cent over those of the third quarter, due chiefly to the sharp rise in electrical requirements. The total quantity of iridium, osmium, rhodium and ruthenium sold for industrial and artistic use rose by 80 per cent in the period; sales of rhodium, which comprised nearly three-fourths of the total, were nearly double those of the third quarter.

Refining of platinum in the fourth quarter of 1959 was at a rate of 28 per cent higher than in the third quarter, while imports of refined platinum (76,500 oz.) rose by 83 per cent. Though working stocks of refiners and dealers in process or in transit rose moderately in the quarter, they were about 9 per cent lower than at the end of 1958.

Refining of palladium in the fourth quarter was at a rate of 33 per cent above that of the third quarter, while imports of refined palladium (158,900 oz.) increased by 81 per cent.

## QUICKSILVER'S FIRMER TONE

The undertone of the London quicksilver market is becoming rather more reassuring. Available metal on the spot is reported to be not very plentiful at the present time, and the ex-warehouse price of £70 10s. - £71 per flask appears more securely based than recently, sales having been made for small lots at the top end of the range.

Demand internationally is reported to be keeping up quite well. The two leading producer countries, Spain and Italy, are understood to be holding satisfactory order books for the time being, while stocks in Italy, though still sizeable, are much smaller than they were some time ago.

★

Quicksilver production in the U.S. in 1959 declined for the first time since 1950, reports the Bureau of Mines; output during the year totalled 30,750 flasks and was the lowest since 1956. General imports of quicksilver totalled 30,260 flasks in 1959, being 2 per cent less than in 1958. Although imports in both years included metal received through barter (6,000 flasks in 1959 and 10,000 flasks in 1958), receipts of quicksilver were the lowest since 1955. Spain and Italy supplied 78 per cent of last year's imports. Quicksilver was received from Turkey for the first time since 1956, and from Australia and New Zealand for the first time since import data by countries became available in 1922.

U.S. consumption of quicksilver rose slightly to 53,100 flasks from 52,617 flasks in 1958, being helped by installation of a new chlorine and caustic soda plant at Deer Park, Texas, and by expansions at similar plants at Anniston, Ala., and Calvert City, Ky.

## JAPANESE ALUMINIUM IMPORTS

Japan will require no further imports of aluminium ingots after this year in view of an anticipated increase in domestic production to 170,000 tons annually next year, an amount believed to be sufficient to meet demands. This was disclosed by the Ministry of Trade after an announcement that the import of 9,000 tons of primary aluminium had been authorized under the import budget covering the first half period (April to September) of the current financial year. The Ministry said that these imports were designed to relieve the present shortage of aluminium in Japan, which had come about as a result of a growing demand from local aluminium fabricators.

Three leading Japanese aluminium smelters are shortly expected to sign a contract with the Western Mining Corporation covering the import of 10,000 tons of bauxite from Australia on a trial basis. The Western Mining Corporation's bauxite mine near Perth is believed to have promising deposits. Japanese refiners are also reported to be showing interest in the Cape York deposits, owned by the Commonwealth Aluminium Corporation.

★

The Senate Finance Committee Washington has approved and sent to the Senate a measure that would continue for two years the present suspension of duty on certain alumina and bauxite.

★

Kaiser Aluminium has reported development of a new series of heat treatable aluminium alloys and a chrome plating process which, it is stated, "will do much to bring about the early use of aluminium bumpers on cars." According to the company, the development should permit the production of aluminium bumpers at costs competitive with steel while meeting strength and corrosion resistance requirements and reducing weight by 50-60 per cent.

★

Plans to build the world's two biggest aluminium barges for the transport of sensitive liquid chemicals have been announced by Reynolds Metals. Under a contract signed with National Marine Service, a leading inland waterways carrier, Reynolds will build the barges and lease them to National Marine. The first barge will be used on the Mississippi-Ohio river system. It will

be 130 ft. long, 50 ft. wide and 12 ft. deep, and, due to its light-weight, will draw only 8.6 ft. when loaded. Its cargo tanks will hold 12,500 barrels and it will carry 1,600 s.tons — 20 per cent more than is possible on steel barges of the same size and draft.

★

Exploitation of a large new bauxite deposit is reported to have begun at Halimba, western Hungary. The deposit is 12 m. thick and is 200 m. below surface. The deposit is said to be sufficient to supply the country with enough bauxite to fulfil the complete 1961-1965 five-year industrial plan. Further bauxite deposits are reported in other parts of western Hungary.

Hungarian production of bauxite last year at 957,000 tonnes, is reported to be so increased as to permit an output in 1965 of 280,000 tonnes of alumina and 63,000 tonnes of aluminium. (1959, 191,000 and 45,000 tonnes respectively).

## COPPER · TIN · LEAD · ZINC

*(From Our London Metal Exchange Correspondent)*

During the short period under review the strength of the copper market has been maintained in spite of continued reports of unsatisfactory business from the U.S. On the L.M.E. stocks declined by 38 tons to 1,811 tons and the backwardation continued to widen. In the U.S. the price structure remained relatively the same although both the price for export and for custom smelters' intake of scrap increased.

The other three markets have been featureless although demand for all three metals is reported as satisfactory, both in Europe and the U.S. The Eastern price on Wednesday was equivalent to £789 per ton c.i.f. Europe.

Closing prices and turnovers on Wednesday appear in the following table:

| | April 7 *Buyers* | *Sellers* | April 13 *Buyers* | *Sellers* |
|---|---|---|---|---|
| COPPER | | | | |
| Cash | £255 | £255½ | £264 | £264½ |
| Three months | £240½ | £240½ | £243½ | £244 |
| Settlement | £255½ | | £264½ | |
| Week's turnover | 8,725 tons | | 8,825 tons | |
| LEAD | | | | |
| Current ½ month | £77⅛ | £78 | £76⅞ | £77 |
| Three months | £76⅛ | £76⅜ | £76⅛ | £76⅛ |
| Week's turnover | 7,400 tons | | 6,900 tons | |
| TIN | | | | |
| Cash | £789½ | £790 | £787 | £787½ |
| Three months | £786½ | £787 | £784½ | £785 |
| Settlement | £790 | | £787½ | |
| Week's turnover | 805 tons | | 490 tons | |
| ZINC | | | | |
| Current ½ month | £91⅛ | £91⅜ | £92 | £92⅛ |
| Three months | £89¼ | £89⅜ | £89 | £89¼ |
| Week's turnover | 6,175 tons | | 4,700 tons | |

**This week we go to press on Wednesday on account of Easter and all our market notes are accordingly written a day earlier than usual. For this reason our metal market news has been abridged. London Metal and Ore Prices appear on inside back cover.**

*Mining Finance*

# Rio Tinto Earns More, Pays the Same

The difficult position in which Rio Tinto's Canadian uranium interests have been put as a result of the United States' and United Kingdom's decision to take delivery of Canadian uranium over a longer period than that already contracted for has left no mark on the parent company's profits for 1959, although there is an indication that distributable earnings may have been affected. Rio Tinto's 1959 results have, in fact, been boosted by rising investment income from the stake in Northern Rhodesian copper shares and by the flowering into profitability of the Australian uranium venture, Mary Kathleen. Thus, with investment income up from £1,455,000 in 1958 to £2,086,000, Tinto's income less expenditure expanded to £3,914,000 from £3,157,000 in the previous year. The tax-free nature of Mary Kathleen's earnings presumably accounts for a relatively lower tax charge of £1,216,000.

After special credits the net profit of the group, excluding Rio Tinto of Canada and its subsidiaries, comes out at £2,829,000 against £2,004,000. Amortisation of Kern's oil reserves again requires £250,000. The profit attributable to minority interests shoots up to £732,000, also a reflection of the Mary Kathleen set-up, and two new items appear. Firstly, £401,000 is appropriated to reserve against exploration and development, now an important part of the group's activities. Secondly, £247,000 is put to capital reserve for exchange differences and subsidiary companies' adjustments, both for prior years.

### DIVIDEND KEPT AT 20 PER CENT

These appropriations whittle the available balance down to £1,199,000. Preference dividends require £85,000, leaving £1,114,000. It has been decided to pay 20 per cent on the 10s. stock units absorbing £894,000 or exactly the same as a year before when 15 per cent was declared on account of 1958 and, for tax reasons, a "special" interim of 5 per cent was added, technically on account of 1959. The balance carried forward is little changed at £2,525,000.

A further part of the preliminary statement deals with the proportion of the profits of Rio Tinto of Canada and its subsidiaries attributable to the parent company but not included in its figures. This proportion for 1959 is £1,068,000, but on this occasion there is a deduction of £670,000 being the parent company's proportion of intangible assets written off by the Canadian concern and its obvious need to provide for depletion of investments. Nevertheless, Tinto's balance from this source, not available for distribution as dividend, now totals £1,451,000.

As may be seen, Rio Tinto's 2s. dividend is covered just on twice by available earnings before appropriations and before taking Rio of Canada's figures into account. There are two strong indications that profits should expand further in 1960. Rhodesian copper dividends are still rising. This year there will also be the income from the £2,250,000 investment in the Southern Rhodesian gold mine, Cam and Motor. The financing of the latter acquisition is a conundrum which it is presumed will be answered in the full report expected to be published on May 5.

In the meantime, Tinto at 38s. 3d. cum dividend offer a yield of 5.4 per cent. The units are at their lowest level for many a long year. A forthright clarification of the group's financial position is needed from the chairman, Mr. Gerald Coke. It is to be hoped that he will give it either in the report or at the annual meeting.

### RIO TINTO OF CANADA

Rio Tinto Mining of Canada naturally has as one of its chief handicaps in present circumstances the depreciation in the value of its uranium holdings. Thus at December 31 last quoted investments appearing in the balance sheet at a cost figure of $45,417,443 had a market value of only $26,874,867. Thus all the net profit of $2,756,812 for 1959 is used for various writing off purposes leaving the carry forward exactly unchanged at $393,335.

The Rio Tinto group in London holds 54 per cent of the Rio of Canada equity. The latter concern now embarks on 1960 with its uranium interests consolidated into a single concern, Rio Algom Mines, in which it will hold a 37 per cent interest. Rio Algom is setting out to make the best of the bad job resulting from the new contract arrangements for uranium. It is not thought that there is any chance of a dividend from the new concern until at least 1962.

### A VOICE FROM JOHANNESBURG

What follows is a brief dispatch from our South African mining correspondent written last weekend. It is significant in underlining the uncertainty and self questioning which has pervaded all sections of the European community following the events of recent weeks. Politically, the mood of the urban electorate at least has probably never been more malleable. What is lacking is the new Messiah. Our correspondent writes:

"As can well be appreciated in recent weeks in South Africa, few people have any thoughts for mining matters and little attention is paid to what is happening in the industry. The reason for this is twofold. Firstly, the state of emergency dominates everything, and, secondly, the mining industry has been completely unaffected by it.

"On the first point, it may be opportune to comment that there has never been a situation in the Union—with the possible exception of the gold standard crisis of the early 1930s—where the government's policy has been so completely out of tune with the opinions of the people, no matter what the individual's party political affiliations may be, than at present. Your correspondent in his wanderings around various places from the inner sanctums of the mining houses to the "local" frequented by railway bus drivers and mine workers, has found the same grave concern about what has happened, is happening, and can happen, expressed in all variations of the country's two official languages.

"It could be argued that the columns of a technical publication such as this is no place for political questions, but in the light of the wholesale damnation of South Africa by the rest of the world, there is justification

for saying that all thinking people here recognize that a change is not only overdue in race relations, but that it must be brought about soon.

"How this can be done is the problem that is debated wherever one goes. There have been rumours of a National Coalition Government — a phenomenon which has rescued the country in previous crises — but as things stand today, no outstanding personality has yet emerged to deliver a clarion call to rally the country behind him and gain sufficient followers in Parliament to bring about a general election."

### RHODESIAN SELECTION TRUST GROUP

The Rio Tinto directors will no doubt have been cheered by the general spirit of optimism with which Sir Ronald Prain conducted his annual informal meeting of Rhodesian Selection Trust shareholders in London. Neither at this meeting nor at the lunch for City Editors that followed it did Sir Ronald allow himself to be other than calm and unruffled about the political situation in the Rhodesian Federation. On the subject of the copper price he was naturally not drawn into any forthright forecasts but the impression was gained that Sir Ronald was not pessimistic, anyway on the long view, and had the feeling that the "magic" figure of £240 per ton, regarded as satisfactory both for producers and consumers, could be maintained, although admitting that the course of the quotation over the next few months following the ending of the prolonged labour strikes in the American mines could be an erratic and uncertain one.

Sir Ronald indicated that Roan Antelope was keeping up well to its target of 87,500 tons for the year to June 30 next and that the same could be said about Mufulira's 102,000 tons. Production capacity at these two mines plus Chibuluma was about 210,000 tons a year and expansion at Mufulira and Chibuluma should raise this in due course to 260,000 tons. The March quarterlies of the three companies are due early next month.

### OPENING UP S.A. LAND'S NEW GROUND

In the annual report of the South African Land and Exploration company the chairman, Mr. H. C. Koch, deals at some length with the company's plans for opening up the new Withok ground that this old eastern Rand mine has acquired to the south of its present property and which looks like giving mining operations a fresh lease of life. The plans include a new shaft system which with its sub-vertical extension will reach a depth of 7,450 ft. below the surface. When this is commissioned, estimated to be towards the middle of 1962, "Sallies" will immediately start drawing ore from its new ground through stope faces made available by development work effected from existing workings.

The estimated cost of £2,724,000 is being financed partly by the proceeds of last January's £2,000,000 issue of 6 per cent Notes, partly by the proceeds of the 825,000 shares of 3s. 6d. to be issued at par in August, 1963, and partly from profits. The effect on the last-named has already been seen. The company made a net profit of £625,000 last year, but only £216,000 was paid out in dividends (1s. 9d. a share) no less than £550,000 being appropriated for capital expenditure, cutting the carry-forward from £503,000 to £362,000. "Sallies" shares stand at 13s. 3d. The Notes look more attractive at 18s. especially in view of the accompanying option to take up 2 shares at 3s. 6d. each in 1963 for every £5 of Notes. Here, in fact, seems to be one of the safest ways of taking a chance on the gold price being raised one of these days.

### ANACONDA IN 1959

Gross sales of the Anaconda Company in 1959 totalled $632,722,027, 21 per cent higher than in 1958. Net earnings were $59,225,859, equivalent to $5.53 per share compared with the equivalent of $3.16 in the previous year. Dividends paid totalled $2.50, against $2.00.

The most significant event in Anaconda's year was the opening last June of El Salvador mine and plant in Chile. With the plant now installed, El Salvador is capable of producing more than 100,000 tons of copper annually, making it the largest mine and plant to have been opened since 1943. Production at Chuquicamata, Anaconda's other big Chilean mine totalled 612,994,731 lb. in 1959.

When El Salvador reaches full production later this year, approximately two-thirds of Anaconda's copper production will come from that country.

### RECORD YEAR FOR KERR-ADDISON

The annual report for 1959 of Kerr-Addison Gold Mines is a most impressive document, from the points of view both of its appearance and contents. Inside its glossy covers are recorded record profits—$1.08 per share compared with $1.01 last year—and record gold production of 567,305 oz., 25,036 oz. higher than in 1958. The increase in production was entirely due to an improvement in the grade treated, tonnage throughout remaining unchanged.

Quite apart from Kerr-Addison's own mining operations, the company is making strenuous efforts to build up prospects and interests. Three prospecting parties and a prospector on grub-stake have been working in Ontario and Quebec, and reconnaissance and prospecting further east have been carried out under the direction of a geologist. In addition, Kerr-Addison is participating in exploration in conjunction with other companies.

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**Patino Mines Receipts.**—Patino Mines and Enterprises Consolidated estimates that during the first three months of 1960 it received from the Bolivian Government $66,500 after net estimated expenses. This compared with $182,114 after expenses, received during the first three months of 1959. The decline was due primarily to lower tin production at the mines, the company said. The company's tin properties were nationalized on October 31, 1952. The properties are being operated by an agency of the Bolivian Government.

**Wankie's Interim Unchanged.**—Wankie Colliery, the Rhodesian coal producer, has declared an unchanged interim of 6d. per share on account of the year to August next.

## LONDON MARKET HIGHLIGHTS

A very nervous South African gold share market opened for business on Monday morning following the week-end assassination attempt on Dr. Verwoerd. The immediate reaction was inevitably to embark on a widespread marking down of share prices. Practically no selling developed however, and as prices were cautiously lifted back again a revival of Cape demand set in.

For a while the firmer tendency persisted on the Tuesday but enthusiasm soon succumbed to a general feeling of depression which spread from other parts of the House. St. Helena, which had risen to 65s. 6d. following the recovery in March quarter gold values, later gave up the improvement. This was about the only response made to the first batch of quite satisfactory March quarterly reports whcih were issued by General Mining, Union Corporation and "Johnnies".

Free State Geduld (132s. 6d. after 133s. 9d.) were also unmoved in front of a quarterly report telling of 92 per cent payability and gold values of 1,295 inch-dwts., fully up to the mine's high standards. Harmony, however, perked up to 30s. 3d. on hopes of some encouraging quarterly news. Loraine were slightly easier at 30s.; after hours the quarterly report for this mine made its appearance and contained little to justify the recent tendency of the shares to resist the general downtrend.

In the Diamond group De Beers again fluctuated erratically, falling to 136s. 3d. then rallying to 142s. 6d. before closing on Tuesday evening at 141s. 10½d. Platinums moved narrowly.

Copper shares followed the trend in Golds. Despite the continued firmness of the metal price, Rhodesians thus looked rather dismal at Tuesday night's closing levels. Chartered dropped 1s. to 80s. 6d. and "Rhoanglo" were 1s. 3d. down at 69s. 6d. "Tanks" were particularly depressed, losing another 1s. 3d. to a low of 32s. 6d.; the company derives the bulk of its revenue from a big holding in Union Miniere, the Belgian Congo copper property, and there were worries about the company's future with the coming of full independence in July.

Tin shares held steady enough and being helped by further good dividend news would certainly have gone ahead were it not for the psychological effect of dullness elsewhere. Even so, Tronoh (32s. 9d.) made some response to the higher interim and there was a quiet demand for Tekka (8s. 1½d.). Also firm were Tanjong (24s. 6d.) on dividend hopes.

As far as Lead-Zincs were concerned, share prices continued to move rather uncertainly. Consolidated Zinc came back to 73s. 6d. in sympathy with the dullness of Industrial share sections.

Elsewhere, shares of Globe and Phoenix, the Rhodesian gold producer, staged a sharp rise to 35s. following the news of a final dividend of 20 per cent making 120 per cent on the 5s. shares for last year (against 100 per cent) together with an interim of 100 per cent for the current year. Murchison closed unchanged at 45s.; news of a setback in March quarter profits (from £211,000 to £138,000) was announced after the market had closed.

# ANGLO AMERICAN CORPORATION OF SOUTH AFRICA LIMITED

## Extracts from the Statements by Mr. H. C. Koch, Chairman of THE GROUP'S RAND GOLD-MINING COMPANIES

(All companies mentioned are incorporated in the Union of South Africa)

### BRAKPAN MINES LIMITED

RENOVATIONS to the reduction works completed early in 1959, together with the abundant supply of Native labour enabled the mine to mill a record total of 1,672,000 tons. However, the benefit of the higher mill tonnage was offset by a decrease of 0.24 dwt per ton in the recovery grade. In consequence, the working profit of £128,136 was lower, by £23,318 than that for the previous year.

Development during the year was confined mainly to three areas of the mine. At the No. 2 Shaft exploratory work was centred on the footwall reef where further payable reserves were disclosed; at the No. 3 Shaft a start was made with an investigation into the potentialities of the Main Reef Leader in the shaft pillar; and to the south of No. 5 and No. 6 Shafts development was continued in the strip of ground lying between the common boundaries with the South African Lands and Van Dyk Mines lease areas. As must be expected in this stage of the mine's life the total footage driven on reef at 26,041 feet was 8,685 feet less than in the previous year. While sampling of 16,730 feet disclosed a decrease in percentage payability from 23.2 to 18.4 per cent, the average value of the payable footage was 819 inch-dwt as compared with 728 inch-dwt in 1958.

Recalculation of the ore reserve at the year end revealed a decrease in tonnage from 1,940,000 to 1,593,000 and a small decline in average value to 4.79 dwt per ton. Owing to the difficulty of estimating the average value with any accuracy, the tonnage available in surface dumps has not been included in the ore reserve.

Your directors decided that this company should follow its investment in the South African Lands company. This investment had been reduced to 315,000 shares at the date of the offer and the company accordingly subscribed in February, 1960, for its full entitlement of £252,000 of the notes.

Of the 361,067 shares held in the South African Lands company at the end of 1958, 46,067 were realized during 1959. This was done to put your company in adequate funds to meet its obligations under the arrangements, then pending, for the reduction in share capital. The profit of £33,993 arising out of this transaction has been placed to capital reserve.

Excess of sundry revenue over expenditure was £73,063, which, together with the working profit of £128,136 brought the surplus for the year to £201,199.

The total amount available for appropriation at the year end was £541,425. Provision for taxation and the government's share of profits under the mining lease absorbed £13,443, directors' special remuneration £2,269, and a dividend of 4½d. per share £86,250. The appropriation of these sums and the transfer to reserve of £115,000 arising from the first repayment of share capital, left £324,463 to be carried forward.

Details of the reduction in share capital that was effected in 1959 are contained in the report of the directors. The repayment of share capital made to members registered at December 31 1959, amounted to £115,000 and was equivalent to 6d. per share. This repayment, being the first payment on account of the 4s. 9d. per share by which the capital of the company has been reduced, leaves 4s. 3d. unpaid. Members should not construe this, however, as an indication of the amount to be distributed by way of repayment of share capital in the future.

### DAGGAFONTEIN MINES LIMITED

THE successful deployment of the additional Native labour which has become available made it possible for a total of 2,850,000 tons of ore to be milled during 1959. This ore was won from three main sources. On the Main Reef Leader much of the tonnage was mined from haulage pillars which are now being extracted systematically as the ground served by the haulages becomes mined out. On this horizon a significant tonnage was also reclaimed from old workings. On the Kimberley Reef horizon, ore was derived from normal stoping operations in the northern and eastern portions of the property.

A continuing decline in the recovery grade, although small, and a slight increase in working costs per ton milled more than off-set the benefit of the higher tonnage sent to the mill. This led to a further fall in the working profit from gold. There was also a reduction in the working profit from the sale of uranium oxide and sulphuric acid. A slightly greater quantity of uranium was sold but recovery was lower and the cost of production, per pound sold, accordingly higher.

Apart from a limited footage driven to delineate payable extensions to areas already blocked out, development on the Main Reef Leader was confined to haulage pillars in preparation for their extraction. On the Kimberley Reef, the development was done mainly in the area between Nos. 3 and 4 Shafts where proven blocks of ore were divided to provided working faces for stoping. There was little change in the percentage payability or in the average of the payable values.

Following the trend in previous years, there was a further decrease in the ore reserve to 8,847,500 tons with an average value for gold of 5.15 dwt and for uranium of .375 lb. per ton. The reserve of uranium bearing slimes on the Kimberley Reef slimes dam also declined from 2,184,000 to 1,874,000 tons with an estimated average value of 0.4 lb. of uranium oxide per ton.

The working profit from the production of gold and the estimated profit from uranium and suphuric acid for 1959 totalled £4,368,898. Sundry revenue exceeded sundry expenditure by £156,630 making the surplus for the year £4,525,528.

The unappropriated profit from the previous year and the transfer of £100,000 from the uranium reserve, brought the amount available for appropriation to £5,025,558. The government's share of profits payable under the mining lease and taxation absorbed £2,461,514. A sum of £549,079 was appropriated to meet uranium loan repayments and capital expenditure. The director's special remuneration amounted to £7,500. Of the balance of £2,007,465, a total of £1,575,000—equivalent to 4s. 6d. per share—was distributed in dividends, leaving £432,465 to be carried forward into 1960.

Taxation continues to absorb a large proportion of the company's profits. From the beginning of 1953 to the end of 1959, the total working profit from gold, uranium and sulphuric acid has amounted to £34,434,346. Of this, £17,942,203, equivalent to approximately 52 per cent., has been paid to the Government as its share of profits under the mining lease and by way of tax.

During 1959 capital expenditure amounted to £72,901 and it is estimated that expenditure under this heading will be approximately £37,200 in the current year.

Of the 610,540 lb. of uranium oxide produced in 1959, and the stock of 11,709 lb. brought forward from 1958, 572,272 lb. were used to fulfil the company's Agency quota of 572,260 lb. and deliveries of the company's proportion of some small sales made by the Atomic Energy Board. The balance of 49,977 lb. was carried forward for disposal in 1960. The company has not yet been advised by the Board of its Agency quota for 1960 but it is understood that this will not be changed materially.

In the last quarter of 1959, the Transvaal and Orange Free State Chamber of Mines agreed on behalf of the uranium producing companies to participate with the Union Government and certain industrial concerns in the financing of a programme of atomic research. It was estimated that the programme would cost £4,000,000 spread over a period of five years. The Chamber of Mines agreed that the uranium producing companies would contribute £400,000 per annum during this period and that the proportion to be contributed by each producing company would be based on its sales of uranium. This company's contribution towards the first instalment of £400,000 amounted to £18,100.

## THE SOUTH AFRICAN LAND AND EXPLORATION COMPANY LIMITED

IN October, 1959 the Minister of Mines notified the company that it had been granted a mining lease over an area of approximately 4,495 claims extending beyond the southern boundary of the present mine on the farm Withok. The application for this lease had been made by the company earlier in the year on the recommendation of the consulting engineers who had advised that the addition of this new area would substantially prolong the life of the mine. Details of the terms of the lease and of the proposals for the opening up of the new lease area were given to members in a circular dated December 1, 1959.

The facilities provided by the existing shafts do not permit the extension of full-scale mining operations into Withok. The consulting engineers therefore recommended the sinking of a new shaft system sited approximately 10,000 feet due south of the No. 1 Shaft and immediately to the north of the Vogels tear fault. This shaft system will be used to open up that part of the new area, lying between the southern boundary of the old lease area and the tear fault, which has been shown to constitute a natural extension of the present mine. It will also provide a point of attack for the further exploration of the remainder of Withok to the south.

Preparatory work on the ventilation component of the new shaft system was completed by the end of February, 1960. The shaft sinking crews took over early in March. Good progress has been made since then and by March 10 the ventilation shaft had reached a depth of 239 feet below collar. This shaft is to be sunk to a final depth of 4,270 feet. In the meantime, the twin high-speed haulageways being driven from No. 1 Shaft to connect with the new shaft system on the 40 level horizon had, by March 10, been advanced 4,040 feet from the No. 1 Shaft. Provided work is not delayed by unforeseen difficulties these crosscuts should reach the vicinity of the new shaft in the last quarter of the current year. If this is accomplished, it is planned to undertake preliminary work underground at the place where the sub-vertical hoisting shaft will be sunk so that a start can be made on the sinking of the latter shortly after the ventilation shaft holes through. The sub-vertical hoisting shaft is to be sunk to a final depth of 7,450 feet below surface.

During the year the 72 South-east crosscut in the Withok area was turned in a northerly direction and a holing effected with the 2 East Inclined Haulage. A certain amount of development will be undertaken in the area made accessible by this work, and, in addition, current workings will be extended in the north-eastern corner of Withok to provide sufficient faces for stoping immediately the sub-vertical hoisting shaft is commissioned. This is expected to be towards the middle of 1962.

Of the total of 28,040 feet developed in Withok during the year, 12,090 feet were sampled. This compares with 6,370 feet sampled in 1958. As had been expected there was a small decline in both the percentage payability and the average value owing to the greater proportion of development having been done in ground outside the small area in the north-east corner of Withok, where values are generally higher than average. Results were nevertheless satisfactory at 40.1 per cent payability with an average payable value equivalent to 484 inch-dwt. Of the total footage in Withok, 3,935 feet were developed south of the tear fault, 41.8 per cent proving payable with an average value equivalent to 517 inch-dwt.

In the old lease area 22,732 feet were developed, of which 12,470 feet were sampled. In the main, this development was concentrated in the ground to the south. A proportion of the footage was driven in exploratory headings and the balance in the cutting-up of already proven blocks of ore. The payability decreased to 34.1 per cent, and the average payable value was also lower at 412 inch-dwt.

At the year end the ore reserve was estimated to be 3,569,500 tons at an average value of 5.93 dwt per ton. Compared with the previous year this reflects an increase of 51,000 tons and a rise of 0.19 dwt. in the grade. Included in the new ore reserve was a total of 358,000 tons with a value of 8.36 dwt. per ton blocked out in Withok.

In the circular issued on December 1, 1959, the attention of members was drawn to the problem which will be presented by water flowing into the company's workings from neighbouring mines as they close down. During 1959 the first steps were taken to increase the mine's pumping capacity to cope with such water. Of the sum of £600,000 which is the estimated capital cost of this project, £301,610 was expended during the year. While the cost involved is high in relation to the remaining potential of the old lease area, it is more reasonable when considered in the light of the increased life of the mine resulting from the incorporation of the Withok area.

The cost of the new shaft system, the connecting crosscuts on 40 level and the additional pumping equipment has been estimated to be £2,724,000. Of this amount £489,951 was expended in 1959. In addition, a total of £316,309 was spent during the year in connection with the exploration of Withok prior to the granting of the mining lease and on other capital works. Allowing for certain small recoupments the net expenditure on fixed assets during 1959 amounted to £804,955. After appropriating £550,000 from profits towards meeting this expenditure, the excess of expenditure on fixed assets over capital funds provided increased from £886,842 at the end of the previous year to £1,141,797 at December 31, 1959. This latter amount, together with the balance of expenditure still to be incurred, will be financed partly by the proceeds from the recent note issue of £2,000,000 and the proceeds from the rights issue of 825,000 shares of 3s. 6d. each to be made, at par, in August, 1963, and partly from future profits. The notes which are unsecured and bear interest at 6 per cent per annum, are redeemable at the option of the company during the period July, 1963, to December, 1967.

It is estimated that expenditure on fixed assets in the current year will be approximately £995,000.

The additional Native labour available during 1959 enabled the company to achieve a higher milling rate which resulted in an increase in revenue. However, costs continued to rise and the working profit for the year decreased by £10,673 to £644,495. Relief from rising costs cannot be expected until the new shaft system and high speed haulageways are completed.

The surplus for the year was £641,832. The addition of the unappropriated profit at December 31, 1958, brought the total amount available for appropriation to £1,145,578. Taxation and government's share of profits, substantially reduced as a result of increased capital expenditure, absorbed £8,726 as compared with £152,804 in 1958. An amount of £550,000 was appropriated towards the cost of capital works. The balance available for distribution was £579,352.

Members have been told in the circular isued on December 1 that during the period that capital expenditure is being incurred and the notes are being redeemed, the amounts available for distribution as dividends will be materially less than hitherto. This is reflected in the declaration at the end of 1959 of a dividend of 6d. per share absorbing £61,875. The addition of the mid-year dividend of 1s. 3d. per share declared before the new scheme was settled, brought the total distributed by way of dividends during the year to £216,563. The unappropriated balance of £362,789 was carried forward.

## EAST DAGGAFONTEIN MINES LIMITED

DURING 1959 there was a marked improvement in the supply of Native labour available to your company's mine. This made possible the reversal of the downward trend in tonnage milled and footage developed which was evident in previous years.

At 1,208,500 tons the tonnage milled was the highest achieved over the past four years. With increases in the proportion of ore drawn from the Kimberley Reef horizon and in the percentage of waste rock sorted, recovery improved slightly to 3.35 dwt per ton milled.

Exploratory headings driven on the Kimberley Reef horizon into the area north-west of the old Rietfontein shaft disclosed satisfactory values, although the percentage of payable footage was low. Further development remains to be done before the full potential of this area can be determined. Development towards the central portion of the common boundary with the old Rietfontein property continues to open up additional pay zones with satisfactory payability and values. On the Main Reef Leader horizon development undertaken in the north-western corner of the old Rietfontein property also disclosed satisfactory payability and values. Throughout the remainder of the mine, development on this horizon was mainly concerned with the opening up of proven blocks of ore. During the year a total of 20,975 feet was sampled on both reefs; of this 6,440 feet, or 30.7 per cent., proved payable at an average value equivalent to 343 inch-dwt.

The advance of the KR.2 Haulage, being driven from the No. 1 Shaft to provide easier access to the Kimberley Reef reserves in the eastern reaches of the mine, was hampered towards the end of the year by difficult ground associated with the Modder East dyke. When the haulage is completed, probably towards the end of 1960, it will extend some 10,500 feet east-south-east of the No. 1 Shaft and will facilitate the transport of ore from the area.

At the year end the ore reserves were estimated to be 4,744,000 tons at a

slightly higher value of 4.67 dwt per ton. Of the increase amounting to 147,000 tons, 137,000 tons were attributable to the extension of reserves on the Kimberley Reef.

The increase in the tonnage milled and improvement in grade led to the working profit at £403,006, returning to the level of profits in 1956 and 1957. After taking the excess of sundry revenue over expenditure into account, the surplus for the year was £423,370, which, together with the unappropriated profit from the previous year and an amount arising from the realization of certain assets, brought the total available for appropriation to £626,536. Taxation absorbed £162,147 and £8,000 was appropriated for the directors' special remuneration. Dividends absorbed £233,125, representing an unchanged total of 1s. 3d. per share for the year. The balance of £223,264 was carried forward to 1960.

### SPRINGS MINES LIMITED

DURING 1959 the company's working profit increased by £69,964 to £163,502. This was due to the reorganization of milling operations and to the savings arising from the liability for pneumoconiosis compensation.

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In 1959 the company's share of the annual pneumoconiosis contributions was £35,897 compared with £67,776 in 1958.

Sundry revenue exceeded sundry expenditure by £41,553 bringing the surplus for the year to £205,055. This, together with the unappropriated profit at December 31 1958, and £16,460 resulting from disposal of fixed assets, brought the total available profit to £502,245. The government's share of the profits and taxation absorbed £16,727. Of the balance, £252,750 was transferred to reserve in connection with the first repayment of capital to members. £232,768 was carried forward.

Details of the reduction in capital that was effected in 1959 are contained in the report of the directors. The repayment of capital made to members registered at December 31, 1959 amounted to £252,750 and was equivalent to 6d. per share. This repayment, being the first payment on account of the 4s. 9d. per share by which the capital of the company has been reduced leaves 4s. 3d. unpaid. Members should not, however, construe this as an indication of the amount to be distributed by way of repayment of capital in the future.

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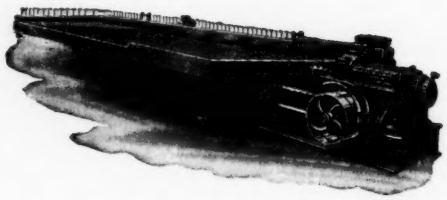

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*This feature appears every fourth week*

# Publications Received

**Civil Engineering. Technical Books-in-Print,** *edited by W. G. Smith, Vol. 1, No. 1, published by Hansom Books Ltd., London. Price 6d.*

This booklet, is the first of a series of catalogues of selected technical books, designed to help the student and reader to know at a glance what publications are available on the subject of his choice. Each month a different technical subject is to be covered by this service, which will be revised and brought up to date periodically.

**Ambassador for Oil** *by John Rowland and Basil, Second Baron Cadman. pp. 186, published by Herbert Jenkins, Ltd., London. Price £1. 1s.*

This official biography of the late Lord Cadman, in the writing of which his son, the second Lord Cadman, collaborated with John Rowland, gives an account of the life of a remarkable and gifted man who made a great contribution to his country.

At the turn of the century, John, later Lord Cadman was Professor of Mining at Birmingham University where his course in oil technology was the first of its kind in Europe. His interest in oil was not, however, only academic, and he was a pioneer in developing the industry in Trinidad. During the First World War, his report on the oil wells of Persia was largely instrumental in persuading Winston Churchill at the Admiralty to change the ships of the Royal Navy from coal to oil-burning.

After the war his career with the Anglo-Persian Oil Company, where he rose to chairman, brought him in daily contact with the greatest figures in politics and science of his day, and as a negotiator, particularly on occasions when far-reaching international issues were at stake, was unsurpassed.

The British Petroleum Co. (Successors to the Anglo-Persian Oil Co.) gave much assistance in the writing of this biography, making available much hitherto unpublished material, and a foreword has been contributed by the chairman, Sir Neville Gass.

★

*The Proceedings of the Symposium on Shaft Sinking and Tunnelling* held in July last year, has been published by the Institution of Mining Engineers. We announced recently that the price of the publication was £3. 3s. This should read £3. 2s. post free.

★

A new, larger edition of Keith Blackman's *Heavy Fan Engineering* booklet (Publication No. 25, 24 pages) has now been published and is available from the Publicity Dept., Mill Mead Road, London, N.17. (Telephone Tottenham 4522, Ext. 310.)

This is a fully illustrated booklet, designed to show the scope of the "Tornado" range of fan engineering equipment in the large and heavy sizes. Individual sections deal with centrifugal and axial fans, blowers and exhausters, ancillary equipment such as air heaters, dust exhaust and collecting plant, and metal structure and fabrications.

A further section provides a brief survey of the manufacturing facilities available at the three Keith Blackman Works at Tottenham and Edmonton, London, and Arbroath in Scotland.

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